

FORESTRY ABSTRACTS

IMPERIAL FORESTRY BUREAU



VOL. 2. No. 3

1941

PUBLISHED BY THE IMPERIAL FORESTRY BUREAU, OXFORD

CONTENTS

	PAGE NO.
A REVIEW OF RECENT WORK ON THE PREVENTION OF <i>LYCTUS</i> ATTACK BY CHEMICAL METHODS	177
ABSTRACT SECTION :	
General Forestry	180
Fundamental Natural Laws of the Forest	185
Silviculture	203
Forest Utilization. Forest Technology	217
Protection	242
Mensuration. Increment. Yield	249
Management. Working Plans. Surveys	251
Economics. Valuation. Finance. Profit and Loss	253
Forest Policy	253
BOOKS	257
NOTES FROM ANNUAL REPORTS	262
NOTES FROM THE DAILY AND THE NON-TECHNICAL PRESS	267
LIST OF ADDITIONAL ABBREVIATIONS	269

FORESTRY ABSTRACTS

VOLUME 2

1941

NUMBER 3

A REVIEW OF RECENT WORK ON THE PREVENTION OF *LYCTUS* ATTACK BY CHEMICAL METHODS

By F. R. CANN, D.I.C.

Forest Products Research Laboratory, Department of Scientific and Industrial Research

INTRODUCTORY.

Under present abnormal conditions, the question of *Lyctus* control may seem insignificant in relation to war-time problems. It may be recalled, however, that it was during the years following the war of 1914-18 that losses due to *Lyctus* assumed serious proportions in Great Britain. Like other insects, *Lyctus* tends to breed and spread most rapidly when left undisturbed with an abundance of food. With no preventive treatment, such conditions are likely to arise in war-time as a result of accumulations of hardwood stocks. When such stocks are ultimately liberated, the resulting spread of infection may be extensive. The time, therefore, seems opportune to review work that has been undertaken within recent years on the control of *Lyctus* by chemical methods.

All stages of *Lyctus* can be killed by subjecting infested timber to a heat-sterilization treatment in a kiln, but it is emphasized that such a treatment is only a temporary cure and prevents neither initial attack nor the possibility of re-infestation after treatment. It has therefore been with the object of finding chemical treatments capable of preventing *Lyctus* attack and suitable for commercial application that a considerable amount of experimental work has been undertaken in Great Britain, the U.S.A. and Australia. Although the main object in each country has been the same, the immediate problems involved have varied considerably.

WORK IN GREAT BRITAIN.

Early investigations by the Forest Products Research Laboratory at Princes Risborough indicated that the bulk of losses due to *Lyctus* resulted from the importation of infested timber and that in comparison attack originating in home-grown hardwoods occurred much less frequently. Attention was, therefore, primarily directed towards the development of a preservative treatment for seasoned or partly seasoned timber in order to render heat-sterilized stock immune from re-infestation and to prevent sound timber, which might come in contact with infested material, from becoming attacked. In the course of this work [1], certain water-soluble salts, which are cheap and do not discolour timber, appeared particularly suitable. A series of tests with these substances was, therefore, undertaken. In the first instance they were applied by a 'full cell' impregnation process in order to ascertain the minimum concentration that would be lethal to *Lyctus* larvae. Seasoned Oak sapwood with a moisture content of 12 to 15 per cent. and *Lyctus brunneus* were used throughout these laboratory tests; no tests on a commercial scale have been carried out. Results showed that water solutions of sodium fluoride and borax gave the most satisfactory results. These preservatives did not prevent egg-laying, but the damage caused by newly hatched larvae before dying was insignificant at concentrations as low as 0.1 per cent. of sodium fluoride and 0.5 per cent. of borax.

In order to avoid the expense of impregnation processes, the possibility of applying these preservatives by short period immersion treatments was investigated. It was found, however, that although higher concentrations were used, *Lyctus* attack was not prevented. Penetration was insufficient even when the test samples were heated to 130° F. for 30 minutes before immersion in the preservative solutions.

In contrast to the failure of water-soluble preservatives, many of the oil and solvent type proved effective when applied by means of an immersion treatment varying from 10 seconds to 5 minutes. Coal-tar creosote is the best known and most widely used preservative of the oil type; its permanence and other advantages, however, are for the present purpose offset by the stain produced, and, although there are on the market several refined creosote products that cause only slight

RECENT WORK ON THE PREVENTION OF *LYCTUS* ATTACK

discoloration of the wood, it is not possible to paint or otherwise successfully finish timber treated with a preservative of this description. The solvent type of preservative consists of a toxic chemical dissolved in a volatile oil or spirit solvent. Among these a chlorinated naphthalene wax and a number of proprietary preservatives containing metallic naphthanates or orthodichlorobenzene have been found effective for the prevention of *Lyctus* attack.

WORK IN U.S.A.

In the United States, where the annual losses due to *Lyctus* were estimated recently at 18,000,000 dollars, *Lyctus* is a serious pest in native hardwoods for home consumption, but it is also important because of the damage it frequently causes in timber for export. The prevalence of *Lyctus* in such timber reaching Great Britain, and the resulting claims by importers for compensation, have led to investigations in the U.S. with a view to protecting their hardwoods from *Lyctus* attack. A related problem of the prevention of sap stain has caused the American workers to concentrate attention on finding an immersion treatment for green timber that would be effective against this defect and would also prevent *Lyctus* attack during and after seasoning.

Investigations on these problems have been undertaken by the Bureau of Entomology and Plant Quarantine of the United States Department of Agriculture, in collaboration with the National Hardwood Lumber Association and several firms of manufacturing chemists. The tests, which were carried out in the laboratory and on a semi-commercial scale at the mill yards of two timber firms, were primarily concerned with treatment of freshly-cut green timber subsequently exposed to attack by *Lyctus parallelopipedus* and *L. planicollis*. First results, published [2] in December, 1939, showed that from amongst a large number of chemicals tested a few water-soluble preservatives were most promising.

Of these, borax, which is an effective sap-stain preventive, appeared to be the most practical and cheapest for commercial application, a 5 per cent. aqueous solution at 130° F., applied to green Oak by means of a 10-second immersion treatment, having given protection from *L. parallelopipedus* but not from *L. planicollis*. The former is the smaller of these two American species and smaller also than *L. brunneus* and *L. linearis*, the powder-post beetles most commonly found in Great Britain; consequently the eggs of *L. parallelopipedus* may not be laid so deeply within the pores of the sapwood. It was assumed by the investigators that this fact accounted for the effectiveness of certain treatments against *L. parallelopipedus* but not against *L. planicollis*. Further tests were therefore undertaken to ascertain whether by raising the temperature of the treating solution, penetration could be increased sufficiently to render the timber immune from both species. While this treatment did not always prevent infestation by *L. planicollis*, it was found that for the most effective results the 5 per cent. borax dip should be applied at a temperature of not less than 180° F.

Although the borax treatment is the only one that has been tested on a commercial scale, recent laboratory tests [3] have shown that sulphur is very repellent to *Lyctus* beetles and that effective protection from attack can be achieved by a 10-second immersion treatment at 190° F. with 1 and 2 per cent. aqueous solutions of "Sulfocide" (sodium pentasulphide in liquid form) or other finely divided sulphur materials. It is stated, however, that further work must be carried out with these substances before they can be safely recommended for commercial trial.

In addition, tests have been undertaken with a number of solvent-type preservatives for the protection of seasoned timber. The most successful results were obtained with a 3 per cent. solution of pentachlorophenol in a light fuel oil in the kerosene range, a minimum immersion period of 3 minutes being recommended. Pentachlorophenol is slightly toxic to man and warm-blooded animals, and continued exposure to the oil solution may cause skin irritation; certain precautions in handling this preservative must, therefore, be observed.

WORK IN AUSTRALIA.

Investigations in Australia have shown that the sapwood of many home-grown hardwoods is liable to *Lyctus* infestation and that some method of protection was urgently required. Recent research on this problem has been undertaken by the Division of Forest Products of the Council for Scientific and Industrial Research, which in the first instance devoted attention to finding a suitable impregnation treatment for commercial-sized timber and later for the protection of veneers and plywood from *Lyctus* attack.

The impregnation tests [5] were undertaken in the laboratory, using a number of water-soluble chemicals and solvent-type preservatives. Sodium fluosilicate proved to be the most toxic substance tested, but owing to the dangers of fluorine poisoning, an account of which was published after these tests were completed, it was decided that fluosilicates could not be recommended for commercial use. Further consideration was therefore given to other water-soluble preservatives, and it was found that borax, boric acid, or mixtures of these were the most suitable alternatives. Chlorinated naphthalenes and other organic preservatives also proved effective, thus confirming the results obtained with such substances in Great Britain.

Following laboratory tests, the use of boric acid has recently been adopted on a commercial scale for the protection of veneers and plywood from *Lyctus* attack [4]. It was found that the treatment could be most easily and economically applied at the green veneer stage and that complete impregnation of veneers 3/16 inch or less in thickness could be obtained by short immersion treatments, provided the preservative solution was maintained at a temperature of 200° to 212° F.

DISCUSSION AND CONCLUSIONS.

An immersion treatment of green timber immediately after sawing would undoubtedly provide the most satisfactory solution to the problem of preventing *Lyctus* attack by chemical means. By treating hardwoods at this stage, the possibility of infection could be eliminated until the wood is dressed or re-sawn for manufacture. When this takes place, untreated wood surfaces are exposed to *Lyctus* attack, since the penetration of water-borne preservatives into timber when applied by short immersion treatments is only superficial. There is little doubt, however, that the bulk of infection occurs before this stage is reached.

The recent work in America on the treatment of green timber should be of considerable interest to the trade in Great Britain. At its present stage, it is too early to say whether the treatment will be completely successful; the results so far obtained with certain chemicals are hopeful, but they require confirmation in practice over a considerable period before they can be generally accepted.

These promising results, however, do not solve the problem of treating seasoned or partly seasoned wood. Penetration of water-soluble preservatives into such timber, when applied by a brief immersion treatment, is insufficient to prevent *Lyctus* attack. Both in this country and in America it has been found that an organic preservative in an oil or spirit solvent may be effective but is more costly; confirmatory tests on a large scale are required before any definite recommendations can be made.

The value of the treatment devised in Australia for the protection of veneers and plywood from *Lyctus* attack is one of the most important advances yet made in *Lyctus* control.

So far as the timber trade in Great Britain is concerned no chemical treatment for the protection of seasoned timber from *Lyctus* attack can be recommended, except with water-soluble salts applied by impregnation processes, until large-scale tests have confirmed the promising results obtained from laboratory experiments with some of the solvent-type preservatives and the cost of such treatments on a commercial scale determined. In the meantime, control measures against this insect must consist of regular inspections of susceptible hardwoods, the segregation of all *Lyctus*-infested material and the heat sterilization or removal and destruction of infested sapwood. The possibility of preventing *Lyctus* attack by rendering timber immune by starch depletion has been the subject of recent experiments, but it is yet too soon to state whether such a method of control could be applied in commercial practice.

LITERATURE CITED

- [1] CANN, F. R. Experiments in Great Britain with wood preservatives for the prevention of *Lyctus* attack. *Forestry* 14, 1940 (27-37).
- [2] CHRISTIAN, M. B. Chemical dip tests against *Lyctus* powder-post beetles. *Sth. Lumberm.* Dec. 15, 1939.
- [3] — *Lyctus* beetle damage prevention. *Sth. Lumberm.* June 15, 1940.
- [4] CUMMINS, J. E. The preservation of timber against the attacks of the powder-post borer (*Lyctus brunneus* Stephens) by impregnation with boric acid. *J. Coun. sci. industr. Res. Aust.* 12, No. 1, 1939 (30-49).
- [5] CUMMINS, J. E., and WILSON, H. B. The preservation of timber against the attacks of the powder-post borer (*Lyctus brunneus* Stephens) by impregnation with various chemicals. *J. Coun. sci. industr. Res. Aust.* 9, No. 1, 1936 (37-56).

ABSTRACT SECTION

NOTE.—A capital letter in square brackets following the reference denotes the language in which the paper is written. A small letter denotes a summary in another or the same language, e.g. [G.e.]—German, with English summary. English [E.] is only indicated for papers published in journals usually written in foreign languages.

The term "billion" used in papers originating in North America means a thousand million.

0. GENERAL FORESTRY

01. METHODS. BIBLIOGRAPHY

01. REST, E. D. VAN. **The analysis of variance applied to proportions.** *Emp. For. J.* 19, 1940 (101-2).

This short paper gives an example of the use of the inverse sine transformation for the analysis of variance of data in the form of fractions or percentages. As the author points out, tables of $\sin\theta : \sqrt{p}$ are available in Fisher and Yates' 'Statistical Tables for Biological, Agricultural and Medical Research', so that the necessary transformations can easily be made.

01 (73). ZIMMERMAN, F. L., and READ, P. R. [Compilers]. **List of available publications of the United States Department of Agriculture, January 2, 1940. Arranged by subjects.** *Misc. Publ. U.S. Dep. Agric.* No. 60, [revised ed.] 1940. pp. 212.

01:11.6 (73). **List of publications and conservation charts of the Soil Conservation Service.** Soil Conservation Service, U.S. Department of Agriculture, Washington, D.C. No. *SCS-B-1*, [revised ed.] 1940. pp. 13.

01:11.6:97.1 (73). ROGERS, E. G., and McILVAIN, Z. E. [Compilers]. **Publications on planning for soil, water, and wildlife conservation, flood control, and land utilization.** Soil Conservation Service, U.S. Department of Agriculture, Washington, D.C. No. *SCS-MP-21*, 1939. pp. 119.

02. DICTIONARIES. LISTS OF VERNACULAR NAMES

02. HUDON, J. E. **Dictionnaire de locutions et termes forestiers techniques.** Tôme I. Français-anglais. [Dictionary of technical forestry terms and expressions. Vol. I. French-English.] Buttée—Ébouter, pp.

65-136 (serial). *Suppl. to La Forêt Québécoise* 1 (9), 1939; 2 (1-8), 1940.

02:12.19.1:12.2 (85). HERRERA, F. L. **Catálogo alfabético de los nombres vulgares y científicos de plantas que existen en el Perú. [Alphabetical catalogue of vernacular and scientific names of the plants of Peru.]** Lima. 1939. pp. vii + 363. [Span.] *Biol. Abs.* 14 (12465).

05.3. Annual Reports

05.3:12.15:13.1 (410). GUNTON, H. C. **Report on the phenological observations in the British Isles from December, 1938, to November, 1939.** No. 49. *Quart. J. R. met. Soc.* 66, 1940 (95-142).

05.3:34.26:07 (91). MALAYA. **The Rubber Research Institute of Malaya. Annual report 1939.** Kuala Lumpur [?]. 1940. pp. 280.

05.3:34.3:07 (54). **Annual report for the financial year 1939-40.** Indian Lac Research Institute, Namkum, Ranchi, Bihar. 1940. pp. 38.

05.3 (588). BALUCHISTAN. **Administration report of the Baluchistan Agency for the year 1st April, 1938, to the 31st March, 1939.** Manager of Publications, Delhi. 1940. pp. 132.

05.3:43:09.4 (73). **National Park Service annual fire report, January 1, 1939, to December 31, 1939.** Washington, D.C. [?]. 1940. pp. 4.

05.3:98 (728.2). BRITISH HONDURAS. **Trade and information report for quarter ended 30th June, 1940.** Govt. Printer, Belize. 1940. pp. 7.

07. EDUCATION AND RESEARCH.

TRAVEL AND STUDY

07: 12.11 (489). HELMS, A. D. **A visit to the Danish Arboretum and Forest Botanical Gardens, June 1939.** *Aust. For.* 5, 1940 (16-20).

07: 97.4 (75.8-76.6). DEMMON, E. L. **Forest research and the southern lumber industry.** *Occ. Pap. Sth. For. Exp. Sta.* No. 90, 1940, pp. 7.

A review of some of the research work being done at the Southern Forest Experiment Station, New Orleans, La., of particular interest to lumbermen of the Southern United States.

09.1. *Forest History*

09.1: 09.7: 91 (54.3). McDONALD, T. **Bori Reserve, 1859-1940.** *Indian For.* 66, 1940 (529-43).

A historical review of the Teak forests of Bori Reserve, in the Central Provinces of India. These forests were the first in India to be reserved and fire protection was practised probably earlier than in any other part of the tropics.

09.1: 32 (71). FAUTEUX, J.-N. **L'exploitation des forêts du Canada sous le régime français. [The exploitation of Canadian forests under the French régime.]** *La Forêt Québécoise* 2 (1, 2, 3, 4, 6), 1940 (11-5, 4-6, 12-3, 13-6, 12-6). [F.]

09.2. *Pre-history*

09.2: 01: 12.2 (75.7). CAIN, S. A. **The identification of species in fossil pollen of *Pinus* by size-frequency determinations.** *Amer. J. Bot.* 27, 1940 (301-8). [University of Tennessee, Knoxville.] O.B.D.

A size-frequency curve for fossil pollen grains of *Pinus* from S. Carolina showed 3 strong modes, which was taken as evidence that 3 species were represented in the deposit. The pollens of 12 modern species of *Pinus* from the eastern United States were also examined, and though no ready diagnostic character was found, there was a considerable range in size. By constructing size-frequency curves for the modern pollens and matching them with the fossil curves, it was found that the mode for *P. banksiana* agreed closely with that of the smallest fossil grains (46.8μ). *P. glabra* seemed the most likely counterpart

for the medium fossil grains (54.5μ), but the mode for the largest fossil grains (62.4μ) was matched by the curves for both *P. rigida* and *P. palustris*, and it was impossible to decide in favour of either species. Use of the size-frequency curve is recommended as an aid when no other method of determining species is possible. In the present case it has enabled the determination that *P. banksiana* was present in former times in a region several hundred miles south of its present range. *From author's summary.*

09.2: 12.19: 11.2 (410). SALISBURY, E. J. and JANE, F. W. **Charcoals from Maiden Castle and their significance in relation to the vegetation and climatic conditions in prehistoric times.** *J. Ecol.* 28, 1940 (310-25).

From an examination of a large number of pieces of charcoal from the Neolithic, Early Iron Age and Late Iron Age deposits probably representing several hundred individual trees and shrubs and comprising some seventeen species, there is evidence that in Neolithic times the chalk of Dorset probably grew a closed woodland plant community of the Oak/Hazel type. In passing from the earliest to the latest period there is evidence of change, probably due to continued climatic action resulting in leaching and the development of a less calcicole flora, while forest destruction by man led to a more open vegetation and less favourable edaphic conditions. Nearly two thousand annual increments of growth have been measured in the prehistoric charcoals of Oak and Hazel, and the results compared with measurements of annual rings in charcoals prepared from recent specimens of the same species. From a statistical analysis it appears that climatic conditions were much the same throughout the period represented as at the present time. The Early Iron Age specimens were few in number and included no species not present in the earlier or later periods. Species present in both Neolithic and Late Iron Age charcoals were: *Corylus avellana*, *Fraxinus excelsior*, *Pyrus malus*, *Quercus? robur*, *Salix* sp. In the Neolithic charcoals only: *Populus* sp., *Rhamnus catharticus*, *Sorbus aria*. In both Neolithic and Early Iron Age: *Taxus baccata*. In Early and Late Iron Age: *Acer campestre*. In the Late Iron Age charcoals only: *Betula* sp., *Crataegus* sp., *Sorbus torminalis*, *Ulmus* sp., *Prunus domestica*,

P. avium, and *P. spinosa*. From authors' summary.

09.2 : 12.19 : 11.2 (79.7). HANSEN, H. P., and MACKIN, J. H. A further study of interglacial peat from Washington. *Bull. Torrey bot. Cl.* 67, 1940 (131-42). [Oregon State College, Corvallis.] O.B.D.

The forest trees represented in an early Puyallup interglacial peat deposit at Seattle were: *Pinus contorta* and *P. monticola*, which prevailed in fluctuating proportions as dominants throughout the period; *Picea sitchensis*, which showed two transitory increases; and *Tsuga*, which was present only as a trace in most horizons. *Pseudotsuga* seems to have been entirely absent. The species were thus similar to those found in other early post-Vashon deposits in this region [cf. *For. Abs.* 2(109)]. The thickness of the peat and the stage of forest succession recorded at the topmost level indicate that the deposit covers only a small part—probably not more than 8,000 years—of the interglacial period. The succession suggests 4 poorly defined alternating periods of coolness and dryness, and warmth and humidity, beginning with the former.

09.4. Forest Statistics

09.4 : 6 (47.1). ILVESSALO, Y. Den andra riksskogstaxeringen i Finland. Några huvudresultat. [The second State Forest Survey in Finland. Some of the chief results.] *Skogen* 27, 1940 (247-9). [Sw.]

The following are some of the chief results of the second State Forest Survey of Finland, carried out in 1936-38:—

(i) Taking into account that a recalculation of the total land area in 1934 gave an increase of 500,000 ha. and that the classification of land types was more strictly interpreted in 1936-38, the total forest area and the productive forest area have decreased by about 200,000 ha. since 1922-23. Most of this reduction has been caused by an increase in cultivated land, built-up areas, etc.

(ii) When correction is made for an overestimate of the hardwood volume in 1922-23, the growing stock on productive forest land remains essentially the same, the mean volume with bark for all species over the whole country being 63.1 cu.m. per ha. in 1922-23 and 62.8 cu.m. per ha. in 1936-38. The total volume with bark was 1,588,000,000 cu.m. in 1922-23 (corrected as above) and 1,560,000,000

cu.m. in 1936-38, thus showing a discrepancy of 28,000,000 cu.m., which is mainly due to reclassification of land formerly regarded as productive forest land but now classed as unproductive. On the whole, therefore, it is probable that the growing stock has diminished but little. There have, however, been changes in the volume by species: thus Scots Pine has been reduced from 777,300,000 cu.m. to 706,000,000 cu.m.; Norway Spruce has decreased in the northern and increased in the southern half of the country, showing a net increase from 480,500,000 cu.m. to 502,800,000 cu.m.; for the reasons already quoted, Birch shows only an apparent decrease; Aspen and Alder, in spite of a reduction in their area, have increased from 22,700,000 cu.m. and 21,000,000 cu.m., respectively, to 29,300,000 cu.m. and 26,600,000 cu.m., this increase being due to the youth of the stands and the resulting high increment.

(iii) No significant change has occurred in the mean annual increment per ha. for all species over the whole country, though figures for the various districts show small differences. The total annual increment for all species has also changed but little, though that of the individual species shows some variation, e.g. that of both Pine and Spruce has risen by about 2,000,000 cu.m. with bark. Most of the latter increase, however, has probably taken place in young stands that will not reach maturity for some time.

Besides the figures already quoted, an attempt is made to show the effect of the cession of territory to Soviet Russia in 1940, but it is emphasized that definite indications cannot be given before the final settlement of the new boundary.

09.4 (47.4). LITHUANIA. Miškų Departamento Metraštis 1918-1938 m. [Report on the Department of Forests, 1918-1938.] Department of Forests, Kaunas. 1940. pp. 127. [Lith., with F. preface and index.]

09.4 : 33 : 98.1 (71). The wood-using industries in Canada, 1934-1936. Forestry Branch, Census of Industry, Dominion Bureau of Statistics, Ottawa. 1940. pp. 124. [E.F.]

09.4 : 33 : 98.1 (71). Wood-using industries in Canada, 1938. Forestry Branch, Census of Industry, Dominion Bureau of Statistics, Ottawa. 1940. pp. 30. [E.F.]

09.4 : 33.1 : 98.1 (71). **CANADA. Production—lumber, lath, shingles, pickets, etc., sawing season 1939, by kinds of wood, by Provinces. Estimated production of lumber in the Provinces of Manitoba, Saskatchewan, Alberta and British Columbia—1939. Total production all species of lumber in Ontario, Quebec, New Brunswick, and Nova Scotia, years 1935 to 1939 inclusive.** Canadian Lumbermen's Association, Ottawa. Jan. 1940. pp. 5. [E.F.]

09.4 : 98 : 99 (71). **CRAIG, R. D. Canadian forest resources: their relation to the war of 1914-18 and to the present effort.** Dominion Forest Service, Lands, Parks and Forests Branch, Department of Mines and Resources, Ottawa. 1940. *Repr. from the Canada Yearbook*, 1940, pp. 251-8.

09.4 : 33.1 : 98.1 (73). **Forest products : 1938. Lumber, lath, and shingles.** Bureau of the Census, U.S. Department of Commerce, Washington, D.C. 1939. pp. 18.

09.4 : 97.4 : 12.2 (75-6). **MOORE, A. G. T. Southern Pine: the South's greatest agricultural crop.** Southern Pine Association, New Orleans. 1940. pp. 53.

This statement filed on behalf of the Southern Pine Association with the Joint Committee on Forestry contains statistics on privately owned Pine forests in the southern United States, on lumber production, and on employment in forestry and sawmilling. Recommendations are made on general policy and on desirable changes in forest legislation.

09.4 (75.8-76.6). **ELDRIDGE, I. F. The new forests of the old South.** *Sth. Lumberm.* 159 (2009), 1939 (99-104). [U.S. Forest Service.]

A concise statement of the forest resources of the Lower South, as recorded during the U.S. Forest Survey. Tables are given to show land areas and conditions, and saw-timber and cordwood volumes for each of the major forest types. The survey has shown that the forests of the region are understocked and deteriorated, representing probably less than half, both in volume and value, of what the forest area could support; but the favourable conditions for growth give promise that under better management the forest will become a permanent asset of the utmost importance to the economy of the region.

09.4 (75.8-76.6). **STOVER, W. S. Growth, mortality, and utilization drain in southern territory, 1936-37.** *Sth. For. Notes* No. 32, 1940 (1).

09.4 (76.1). **ALABAMA. The forest situation in Alabama.** U.S.D.A. Forest Service, Washington, D.C. 1938. pp. 33.

09.4 (76.1). **SPILLERS, A. R. Forest resources of West Central Alabama.** *For. Surv. Release Sth. For. Exp. Sta.* No. 48, 1940. pp. 30.

The productive forest area of this region is 2½ million acres or 61.8 per cent. of the total land area (1935 figures). Loblolly, Shortleaf, and Longleaf Pines, Gums and Oaks are the chief tree species, and about 90 per cent. of the forest area is second growth. Growing saw-timber material totals about 5 billion bd. ft. and the net increment in 1937 amounted to 312 million bd. ft. before cutting, while the drain in saw-log material in that year was 380 million bd. ft., the overcutting taking place in Pine stands.

09.4 (76.1). **CRUIKSHANK, J. W. Forest resources in the Tennessee Valley of North Alabama.** *For. Surv. Release Sth. For. Exp. Sta.* No. 49, 1940. pp. 39.

There are over 2 million acres of forest land in this area, more than half of which is included in farm woodlands. There are 1.5 billion bd. ft. of Pine and 1.8 billion bd. ft. of hardwood on the forest land. The net increment for the area amounted to 155.9 million bd. ft. in 1937 while depletion in the same year totalled 188.2 million bd. ft.

09.4 : 12.2 : 33 : 98.1 (76.5). **GARLAND, H. Hardwood resources and industries in Arkansas.** *Bull. Ark. agric. Exp. Sta.* No. 404, 1940, pp. 50.

09.4 : 22 : 3 : 12.2 (78.6 : 79.5-7). **MARTIN, C. S. Forest resources, cutting practices, and utilization problems in the Pine region of the Pacific Northwest.** *J. For.* 38, 1940 (681-4). [Western Pine Association.]

This region, which lies in that part of the states of Oregon and Washington east of the Cascades and in Idaho and Montana, has a forest area of 70 million acres of which 48 million acres are commercially important. Stands of saw-timber size cover an area of 30 million acres and more than two-thirds of this is owned or managed by government

authorities. Over 50 per cent. of the burned and cutover lands are restocking satisfactorily.

Of the present total saw-timber stand of 259 billion bd. ft. Ponderosa Pine represents just under 50 per cent. and Douglas Fir about one-third. Annual cutting drain amounts to about 3 billion bd. ft.

The management of these forests and the utilization of their products are discussed. It is emphasized that successful management requires the protection of the forests until they reach maturity, particularly against Pine beetles, which have killed almost as much timber as has been cut in Oregon and Washington since 1921, and against the blister rust which is spreading rapidly in the areas of Western White Pine and Sugar Pine.

09.4 : 33.1 : 98.1 (78.6 : 79.6). WHITNEY, C. N. **Production of lumber and timber products in Idaho and Montana, 1939.** *Res. Note Nth. Rocky Mt. For. & Range Exp. Sta.* No. 8, 1940. pp. 3.

The total lumber cut in 1939 by active mills each producing 50 thousand bd. ft. or more was 945,581 thousand bd. ft., the total production of lath was 49,912 thousand pieces and the total quantity of shingles manufactured was 46,536 squares. Detailed statistics are tabulated.

09.4 : 33.1 : 98.1 (79.4). GRUENEWALD, F. A. **Preliminary statement on production of lumber and other timber products in California, 1939.** *Tech. Note Calif. For. & Range Exp. Sta.* No. 13, 1940. pp. 2.

09.4 (79.5 : 79.7). COWLIN, R. W. **Forest resources of the Douglas Fir region.** *J. For.* 38, 1940 (677-80). [Pacific Northwest Forest Exp. Sta.]

This region, which lies in the states of Oregon and Washington west of the summit of the Cascade Mountains, has 29 million acres of forest land of which 26 million acres are capable of growing commercial conifers. Of this area 14½ million acres have stands of saw-timber size, more than 7 million acres have stands of less than saw-timber size, and 4½ million acres are made up of deforested burns, non-restocked cutover lands and recently logged lands. More than two-thirds of the saw-timber stands are Douglas Fir type. Of the 5.4 million acres (1933 figures) of cutover lands not converted to non-forest uses about half have restocked well and half poorly or

not at all. This latter condition is usually caused by fire following cutting and most of the land in this category falls in one of the three best site classes capable of an average annual yield of 400 to 500 bd. ft. per acre.

The saw-timber stand on commercial forest lands in this region in 1938, excluding certain national lands reserved from cutting, was 602 billion bd. ft., of which 598 billion bd. ft. was in conifers. About half of this is privately owned. Under present conditions from 150 thousand to 175 thousand acres are cut over annually in the region and the current cutting drain has been estimated at 9 billion bd. ft. plus an annual loss of half a billion bd. ft. due to fire, insects and windthrow. The current annual growth on areas covered by growing forests of saw-timber size, occupying 5.0 million acres, amounts to 2.7 billion bd. ft. (1933 figures), while the potential annual growth that could be obtained on all the commercial forest land of the region by intensive forest practice is estimated at 9.5 billion bd. ft.

09.4 : 56 (79.6). CUMMINGS, L. J., and KEMP, P. D. **Forest increment in North Idaho.** *For. Surv. Release Nth. Rocky Mt. For. & Range Exp. Sta.* No. 18, 1940. pp. 74.

Analysis of increment figures obtained by the forest survey in the Northern Rocky Mountain Region. In brief the total land area in North Idaho of about 13 million acres contains some 10 million acres of forest land, and of this nearly 50 per cent. is unreserved growing commercial forest. In this forest the current annual increment amounts to 636 million bd. ft. of which 26 per cent. is Western White Pine (*Pinus monticola*), and the current annual drain averages 712 million bd. ft. of which 51 per cent. is White Pine.

09.7. *Monographs of Individual Forest Regions*

09.7 : 12.2 : 90 (79.4). FRITZ, E. **Forest land situation in the California Redwood region.** California Redwood Association, San Francisco. 1939. pp. 48.

Two-thirds of the original 1,500,000 acres of Redwood forest are left and carry a stand of 50 billion bd. ft. The annual cut is nearly 500 million bd. ft. on an average area of 8,500 acres. The Redwood industry accounts for 2 per cent. of the annual lumber production of the United States and gives employment directly to 7,000 people. The industry is

developing a programme of selective logging which will be applied to all Redwood lands in time and with protection should result in an annual growth of 1,000 bd. ft. per acre. *From author's summary.*

09.7 : 12.19.1-2 (82). PARODI, L. R. Los bosques naturales de la Provincia de Buenos Aires. [The natural woodlands of the Province of Buenos Aires.] *An. Acad. B. Aires* 7, 1940 (79-90). [Span.]

09.7 : 22.22 : 33.7 : 72 (66.9). COLLIER, F. S., and LOCKIE, J. R. The Ibadan Fuel Plantations: their history and management. *Niger. For.* 1, 1940 (15-20).

09.7 (68.7). KING, N. L. The Manubi forest. *J. S. Afr. For. Ass.* No. 4, 1940 (24-9).

This forest, which is situated on the east

coast of the Cape Peninsula in the district of Kentani, is 1,726 acres in area. Two-thirds of it is on rich doleritic soil and the remainder on less favourable soil derived from Beaufort shales. Forest quality varies with soil conditions. The average annual precipitation of 48 in. is evenly distributed and the climate is mild. The original forest contained large specimens of *Podocarpus falcatus*, *P. latifolius*, *Ptaeroxylon obliquum* and *Olea laurifolia*, as well as trees of other species. The exploitation of this forest between 1890 and 1904 removed an estimated 210,000 cu. ft., 71 per cent. of which was of the two species of *Podocarpus*. Less valuable but more aggressive species are now occupying the soil, and future management, which should be on a silvicultural basis, will depend largely on finding uses for some of these woods.

1. FUNDAMENTAL NATURAL LAWS OF THE FOREST

11.1. Atmosphere

11.14. Precipitations. Evaporation. Humidity

11.14. TRYON, H. H., and FINN, R. F. A compact precipitation record. *J. For.* 38, 1940 (644-5). [Black Rock Forest, Cornwall-on-Hudson, N.Y.]

The vertical columns of a sheet of ordinary squared paper are headed with the months of the year and a thirteenth column for 'annual total', and years are listed consecutively down the left side of the sheet opposite the horizontal columns. Each monthly and yearly total of precipitation is entered in the proper square, which is then marked according to an appropriate legend, either in water-colour or hatching, to indicate whether the entry represents 'dry', 'average' or 'wet' conditions, with possibly the two additional classes 'very dry' and 'very wet'. The basic classification for the region under consideration was developed from the statistical analysis of precipitation records for a period of over 100 years.

11.4. Soil

11.42. Soil Chemistry

11.42 : 01. BOWER, C. A., and TRUOG, E. Base-exchange capacity determination of soils and other materials, using colorimetric manganese method. *Ind. Engng.*

Chem. (Anal. Ed.) 12, 1940 (411-3). [University of Wisconsin, Madison.] P.R.

11.42 : 01 : 11.47 : 23.27. MORGAN, M. F. The use of rapid chemical soil tests in arboriculture. *Proc. nat. Shade Tree Conf.* 15, 1939 (22-6). [Connecticut Agricultural Exp. Sta., New Haven.]

A list is given of rapid soil tests classified as: (i) single constituent tests (for P and K) involving extraction of the soil with dilute strong acids, with or without buffer salts; (ii) single constituent tests (for N) involving extraction by either distilled water or weak acids; (iii) tests used in combination, involving two or more constituents, with separate extraction for each constituent (P, K, N); and (iv) tests used in combination, involving the estimation of several constituents from a single soil extraction. In each case reference is made to the firm or laboratory sponsoring the test, or to a published account of its nature. Though such tests may be valuable in certain cases, they require careful application and wise judgment in interpretation, and as far as arboriculture is concerned, the condition of the tree growth is a much more reliable guide to 'tree feeding'.

11.42 : 11.46 (79.4). HIBBARD, P. L. Accumulation of zinc on soil under long-persistent vegetation. *Soil Sci.* 50, 1940 (53-5). [University of California.] O.R.E.

Unusually large amounts of zinc were recently detected in the topsoil of widely separated Californian localities that had long remained undisturbed under a heavy cover of trees or grass, the zinc contents being much higher than those of neighbouring soils on which no such accumulation of vegetable debris had occurred. Analyses of soil samples taken at different depths under Redwood, Pine, and Oak, and of leaf samples ranging from fresh leaves to much decomposed leaf litter, indicated clearly that the decay of vegetable litter caused the accumulation of zinc in the topsoil. This result was confirmed by experiments in which water was percolated for 9 days through dried and powdered leaves of the same 3 species placed on top of soil columns in the laboratory. It is stated in a footnote that other analyses, not reported in this paper, show that in topsoil under heavy accumulations of organic matter there are also increased amounts of Cu, Pb, Ni, and Co.

11.42 : 11.46 : 21.3 : 12.2 (43.9). VÁGI, I. **The readily assimilable K_2O content of shifting sand soils in the Hungarian Great Plain in relation to Black Locust plantations.** *Erdész. Lap.* 79, 1940 (252-5). [Hu. g.f.e.]

From the investigations described it appears that the K_2O content of such soils as determined by 'Sigmond's method is an insufficient indication of their suitability for Black Locust.

11.43. Biology of Soil, including Mycorrhiza

11.43 : 12.2 (410). ELLIS, M. **Some fungi isolated from Pinewood soil.** *Trans. Brit. mycol. Soc.* 24, 1940 (87-97). R.A.M. 19 (615-6).

11.43 : 12.2 (943). YOUNG, H. E. **Mycorrhizae and growth of *Pinus* and *Araucaria*. The influence of different species of mycorrhiza-forming fungi on seedling growth.** *J. Aust. Inst. agric. Sci.* 6 (1), 1940 (21-5). R.A.M. 19 (488-9).

Pinus caribaea seedlings were raised in boxes, and the soil was later inoculated with imported cultures of various mycorrhizal fungi, chiefly species of *Boletus*. A control box was inoculated with mycorrhiza from a healthy local stand of *P. caribaea*. At the end of the season's growth the mean height and mean weight of the seedlings grown with the

imported fungi exceeded those of the controls to a degree that varied with the individual species of fungus employed.

In pure culture, seedlings of *Araucaria cunninghamii* formed mycorrhiza in association with *Boletus granulatus* and with an undetermined fungus, possibly identical with *B. granulatus*, isolated from natural mycorrhiza of *A. cunninghamii*. The seedlings failed to develop in pure culture without a mycorrhizal fungus. In field tests the two fungi in question had no different effect on the growth of the seedlings. *Boletus granulatus* produced endotrophic mycorrhiza with *A. cunninghamii*, but ectendotrophic mycorrhiza with *P. caribaea*; thus in this instance the nature of the mycorrhiza seems to depend upon the reaction of the host.

11.44. Soil Cover. Ground Flora. Litter. Surface Humus

11.44 : 11.46-7 : 23.2 : 12.2. DAY, G. M. **Topsoil changes in coniferous plantations.** *J. For.* 38, 1940 (646-8). [Northeastern Forest Exp. Sta.]

In Vermont and New York the soils under plantations of White Pine, Red Pine, Scots Pine and Norway Spruce were compared with those from adjacent open areas and the following observations made: (1) In 18-61 years the plantations accumulated 6,000-38,000 pounds of forest-floor materials per acre. In all cases probably a sufficient amount of forest floor has been formed to check surface movement of precipitation and to permit percolation. (2) Where a mull humus type was developed under a plantation there is an increase in the organic content of the upper layers of mineral soil. Where a mor was developed the topsoil is poorer in organic matter than that in the open areas under grass cover. (3) The surface layers of mineral soil in the plantations have become about twice as permeable to water as those of the corresponding open areas, but this is probably inferior to either the original or the potential capacity of the sites. Mulls showed a greater increase in permeability than mors. *From author's summary.*

11.44 : 11.46 : 12.2 (79.4). KITTREDGE, J. A. **A comparison of forest floors from plantations of the same age and environment.** *J. For.* 38, 1940 (729-31). [University of California.]

Thirty-year plantations growing in the same

environment produced forest floor in amounts decreasing according to species as follows:

Species	Median dry weight of floor, metric tons per acre
<i>Pinus radiata</i>	24.3
<i>P. pinaster</i>	14.2
<i>P. canariensis</i>	12.6
<i>Pseudotsuga taxifolia</i>	12.5
<i>Cupressus macrocarpa</i>	12.4
<i>Sequoia sempervirens</i>	11.2
<i>Arbutus menziesii</i>	9.7
<i>Photinia arbutifolia</i>	4.8

While the amounts of forest floor are not consistently related to the size, density, or growth of the stands, the species growing naturally on or near the area tend to have less forest floor than those introduced from distant localities. The net amounts of floor up to 30 years are continuing to increase at rates in excess of the mean annual. *From author's summary.*

11.44 : 11.48-9 : 11.42 (77.5). GALLOWAY, H. M. **Origin and properties of alkaline raw humus.** *Soil Sci.* 49, 1940 (295-9). [University of Wisconsin.] O.R.E.

A rare type of alkaline raw humus was found on calcareous outcrops of Door Peninsula in the podsol belt of Wisconsin, originating chiefly from the litter of *Thuja occidentalis*, *Abies balsamea*, and a ground flora normally associated with strongly acid soils. The profile showed a dark brown, matted, peatlike duff layer of 4-10 ins. in thickness, grading into highly dispersed black organic matter mixed with limestone particles, and underlain by a somewhat weathered rock substratum. The duff horizon had an average pH of 7.5, an exchange capacity of about 110 m.e. per 100 g. with base saturation approaching 100 per cent., a C/N ratio of 15.9, a high total CaO content (5.9 per cent.), and low available P (0.004 per cent.). Fractionation analysis showed low contents of the ether-, water-, and alcohol-soluble materials and a very low cellulose content (2.65 per cent.), but rather high contents of hemicelluloses (9.22 per cent.) and lignin (38.52 per cent.). These data suggest that, genetically, alkaline raw humus is intermediate between acid raw humus and lowmoor peat. In respect of biological activity, as determined by the CO₂ evolution method,

the alkaline raw humus lies between the acid Hemlock raw humus and slightly acid hardwood/Hemlock duff of a mull nature. *From author's summary.*

11.45. Geological Conditions

11.45 : 11.6. HARDY, F. **Land movements, their classification and relationships to soil erosion.** *Trop. Agric., Trin.* 17, 1940 (187-92). [Imperial College of Tropical Agriculture.]

11.46. Relationship of Plants to the Soil

11.46 : 64 : 56-7 : 12.19.2 (74.7). DONAHUE, R. L. **Forest-site quality studies in the Adirondacks. I. Tree growth as related to soil morphology.** *Mem. Cornell agric. Exp. Sta.* No. 229, 1940. pp. 44. [Cornell University.]

Growth and closely related data on Sugar Maple, Beech, Yellow Birch, Spruce, Balsam Fir, and Northern White Cedar, were obtained on characteristic forest types in the central Adirondacks. Certain soil factors were measured and related to the growth of the trees. Mean annual increment in pounds of oven-dry wood was found to be a satisfactory index to site quality.

11.47. Maintenance of Favourable Soil Conditions

11.47 : 12.2. **Results of fertilizing Black Locust seedlings.** *Extr. from Forest Log* 5 (1), Apr. 3, 1940.

Seedlings treated each with $\frac{1}{4}$ lb. 40 per cent. P₂O₅ grew within two years to almost double the height of the controls.

11.47 : 23.27 : 34.25. STARCHER, G. C. **Nine essential elements of proper tree fertilization.** *Virginia Fruit.* 28 (1), 1940 (174-9). Staunton, Va.

With direct reference to horticulture.

11.6. Hydrographical Conditions including Erosion

11.6. **Influences of vegetation and watershed treatments on run-off, silting, and stream flow. A progress report of research.** *Misc. Publ. U.S. Dep. Agric.* No. 397, 1940. pp. 80.

The outstanding research on this subject is summarized, the period covered being in

most instances up to the year 1938. Fifty-eight references are included, most of which are from American literature.

11.6 (54). BREADON, G. W. D. **Soil conservation by terracing and grading.** *Indian For.* 66, 1940 (430-5).

11.6 (54). BREADON, G. W. D. **Note on terracing for soil conservation and land reclamation.** *Indian For.* 66, 1940 (485-92).

11.6 (76.4 : 78.9 : 79.1). CASSADY, J. T., and GLENDENING, G. E. **Revegetating semi-desert range lands in the Southwest.** *For. Publ. Civ. Conserv. Corps* No. 8, 1940. pp. 22 [Southwestern Forest & Range Exp. Sta.]

11.6 : 07.7. AREND, J. L., and KNIGHT, D. M. **A portable infiltrometer and unit system for determining relative infiltration rates.** *Tech. Note Cent. St. For. Exp. Sta.* No. 11, 1940. pp. 5.

The description of an apparatus especially adapted for the determination of relative infiltration rates of areas comprising numerous soil series, cover conditions and land uses, with specifications and illustration. The total cost of all equipment required for one infiltrometer unit consisting of four infiltrometers and capable of making 12 runs per day is about \$350.00.

11.6 : 11.14 (68.7). KEET, J. D. M. **Rainfall and streamflow at the Cape.** *J. S. Afr. For. Ass.* No. 4, 1940 (15-20).

While in the past plantations of exotic trees have been blamed for adversely affecting streamflow in the Cape Peninsula, it is shown that, in some localities at least, there is a clear relationship between amount and incidence of rainfall and streamflow irregularities.

11.6 : 23.21 : 23.3 (47.2-6). STEPANOV, N. N. **Some remarks on the types of forest cultures of the Central Forest Protection Service.** *Lesnoe Khozyaystvo, Moscow* 1940 (6), (18-22). [R.]

Coniferous woods appear to be unsatisfactory from the point of view of water conservation, particularly those composed of Spruce and Silver Fir. Forestry in the water conservation zone should therefore aim at the creation and maintenance of hardwood and mixed stands, preferably with an understorey of shrubs capable of conserving and improving the soil. From recent research by Kovalevski

it appears that considerable quantities of mineral substances are yielded by the litter of certain shrubs. Thus the quantity by weight of such substances deposited in litter per unit area of first-quality sites was about twice as high for Yellow Acacia and Hazel plantations, aged 12 and 6 to 10 years, respectively, as for comparable 12-year-old Oak stands, and one and a half times as high as for comparable 12-year-old Lime stands. The large-scale creation of understoreys in the water conservation zone of Southern Russia will involve a good deal of acclimatization work, since the shrub flora of these regions is very poor in comparison with the Far East, the Transcaucasus, or the U.S.A.

11.6 : 23.3 : 96 (47.2-6). BODROV, V. A. **The organization of forestry in the 'protection zone' along river banks.** *Lesnoe Khozyaystvo, Moscow* 1940 (6), (6-12). [R.]

The necessity of forest planting along river banks, and especially the central and the lower courses of the Don and the Volga, is discussed. In order to check inundations, erosion, movement of sands, and other ill effects of past deforestation, as economically as possible, it is essential to plan carefully the location of new plantations. Even a relatively low forest per cent. may do if there is a favourable forest distribution. This is the case on the Kamen-naya Steppe (Voronezh) where the coefficient of run-off is practically zero although woodlands occupy only 17 per cent. of the area and only 20-25 per cent. of these woods are correctly located from the point of view of run-off control. It is suggested that afforestation work along the Don, the Volga and other rivers where such work is required should be handled by the Central Forest Protection Service ('Glavlesookhrana'—founded in 1936), but where the land forms part of collective farms, new plantations, while remaining under State supervision, should be placed under the care of the farms shortly after the trees have formed a canopy.

11.6 : 23.3 : 96 (66.9). SYKES, R. A. **A history of the anti-erosion work at Udi.** *Niger. For.* 1, 1940 (3-6).

A large proportion of the work in the Udi plateau, Onitsha Province, consists of 'wave-bedding', a simple and relatively cheap method of dealing with sheet erosion on moderate slopes. Numbers of more or less crescent-shaped shallow beds, each a few square yards

in area, are made across the slope and are protected on their downward side by low ridges, and seeds of suitable species (chiefly Cashew Nut, *Pentaclethra macrophylla*, and *Acacia barteri*) are broadcast in the beds. The method has the advantages that it dispenses with the complication of laying out elaborate contour lines, is adapted to the use of the native hoe, and can be left largely to native supervision. Unfortunately the species that have proved most suitable to the technique have little economic value, with the possible exception of the Cashew Nut; and until the problem of integrating soil fixation with the production of a cash crop is solved, there can be little hope of securing voluntary labour, without which a more general application of the Udi technique would be too costly.

12.1. General Botany

12.11. Physiology. Biology [including Genetics]

12.11 : 11. HEINICKE, A. J. **The physiology of trees with special reference to their food supply.** *Proc. nat. Shade Tree Conf.* 15, 1939 (26-35). [Cornell University.]

Chiefly a popular account of photosynthesis. Tables are quoted from work done at Cornell University, apparently on Apple trees, to show: (i) average production of carbohydrates per day by a mature tree in different months and at different times of day; (ii) assimilation and light between 9.30 a.m. and 2.30 p.m. on 8 successive days; (iii) influence of temperature on rate of apparent photosynthesis; and (iv) increase of food production by leaves of N-starved trees as a result of applying fertilizer.

12.11 : 11.11 : 11.15 (481). ÅLVIK, G. **Über Assimilation und Atmung einiger Holzgewächse im westnorwegischen Winter. [On assimilation and respiration in some woody plants under west-Norwegian winter conditions.]** *Medd. Vestland. forstl. Forsøkssta.* 6 [4 (22)], 1939, pp. 266. [G.g.nor.]

The main results of an extensive series of laboratory experiments with small evergreen seedlings were adverse to Printz's theory that the western coniferous tree limit in Norway is conditioned by light deficiency coupled with excessive warmth in winter. It was shown that: (i) The average daylight in Vestland is sufficient at the prevailing winter temperatures to give a positive balance of assimilation over respiration

in Spruce and Pine for the greater part of the winter. Only in December is there any probability that respiration may occasionally exceed assimilation. (ii) Such typical plants of the region as Heather and Juniper needed as much as or more light than Spruce and Pine to maintain a positive assimilation balance. (iii) Under conditions unfavourable to assimilation (deficiency of salts and CO_2), respiration dropped lower than assimilation, so that a positive balance was attained with less light; thus starved Spruce and Pine seedlings achieved a positive balance with light that merely sufficed for equilibrium in normally grown plants of shade-bearers such as Holly and Ivy, which required only half as much light to maintain equilibrium as Pine or Spruce under natural conditions.

The remainder of the paper deals with experiments made to test two conclusions reached by Printz in a recent paper on the influence of temperature on respiration, namely that: (i) Respiration shows a particularly sharp rise between 0° and 10° C. (ii) Respiration increases with fluctuations in temperature ('thermic stimulus'), resulting in a greater loss of dry weight with fluctuating than with constant temperatures, even if the average temperature is the same. Printz's experiments were made chiefly on hardwoods and did not include Pine or Spruce. The present author's results with these two species show that their respiration follows the general rule (van't Hoff's law) in that respiration becomes 2-3 times as great for each temperature rise of 10° C., i.e. the normal increase of respiration with temperature gave a 'temperature quotient' (Q_{10}) of 2-3. Around 0° C., however, the Q_{10} of Pine reached values of 30 and over, and it seems probable that the transition to a frozen condition is characterized in this species by more or less sudden changes in Q_{10} . Above 0° C. the relations once more become normal, and for Pine and Spruce seedlings there seemed to be no sudden rise between 0° and 10° C. as found by Printz for other species; neither was there any evidence of a 'thermic stimulus' with rises of temperature.

A further series of experiments with various hardwoods confirmed the author's belief that Printz's 'thermic stimulus' concerned CO_2 excretion rather than the uptake of O_2 . During the autumn and winter months no marked 'thermic stimulus' could be provoked by increases of temperature, the response being

merely small and gradual increases in respiration. In spring, however, warming resulted in a sudden but temporary rise in CO_2 excretion, accompanied by a gradual rise in O_2 uptake which continued after the peak of the CO_2 curve had been reached and passed. This rise in O_2 uptake usually coincided with the first signs of bud opening. The 'thermic stimulus' thus appears to be a phenomenon related to those involved in artificial forcing, and may be expected to show seasonal variation, of which there is some evidence. Several possible reasons for the sudden rise of CO_2 excretion are discussed.

Printz's observations on the loss of material following a 'thermic stimulus' are based on the assumptions that the respiratory quotient is constant and that a drop in temperature would have either no effect or the same effect as an increase. The respiratory quotient, however, has been shown to vary, and work by Barker on potatoes indicates that a fall in temperature depresses respiration. Any material loss of substance due to changes of temperature seems unlikely, for in winter the effects of temperature are offset by other plant processes, and in spring the possible losses temporarily accompanying rising temperatures are probably no more than a part of the mechanism normally governing the development of the plant.

12.11 : 12.14. HEYN, A. N. J. **The physiology of cell elongation.** *Bot. Rev.* 6, 1940 (515-74).

12.11 : 12.14 : 12.2. GOODWIN, R. H., and GODDARD, D. R. **The oxygen consumption of isolated woody tissues.** *Amer. J. Bot.* 27, 1940 (234-7). [University of Rochester, New York.] O.B.D.

Thin sections of tissues were cut from the trunks of Ash and Maple trees and their oxygen consumption was measured. In trees collected before bud break oxygen consumption is most rapid in the cambial region. Values for the adjacent secondary phloem and xylem are somewhat lower. In the xylem oxygen consumption becomes progressively lower as one passes towards the centre of the tree. In the heartwood there is a very low basal rate of oxygen consumption which is not destroyed by boiling. This is probably due to slow oxidation of organic compounds, in the dead cells. Phloem and sapwood exhibit similar oxidations of comparable magnitude after boiling. After bud break the oxygen consumption of the

cambium, phloem, and heartwood of *Fraxinus* is essentially the same as before bud break. In the newly-formed, differentiating xylem, however, it appears to exceed considerably the cambial rate. The above relations remain essentially the same whether oxygen consumption is expressed per gram wet weight or per milligram of nitrogen. *Authors' summary.*

12.11 : 12.15 : 23.1 : 23.23.1 : 12.2 (52). SATO, Y. **Über den Samenabfall bei Sachalintannen und Esfichten-Mischbeständen. [On seed fall in mixed stands of *Abies sachalinensis* and *Picea jezoensis*.]** *Res. Bull. Coll. exp. For. Hokkaido Univ.* 11 (2), 1940 (1-18). [Jap.g.]

The investigation was carried out between 20th September and 1st December, 1938, in a dense, unthinned stand and in stands in which thinnings had been carried out reducing the basal area by 30 and 50 per cent. respectively. The main seed fall of *A. sachalinensis* occurred between the 21st and 31st, and that of *P. jezoensis* between the 11th and the 20th of October. Forty-three and 50 per cent., respectively, of all the seed shed by the two species was collected during these periods. The main seed-fall periods coincided approximately with those of highest seed weight, maximum germination capacity and lowest occurrence of empty and of insufficiently matured seed. Taking the period of investigation as a whole, the percentage of germination was the lowest, and that of empty and insufficiently matured seed the highest, in the unthinned stand, while the most favourable corresponding percentages were obtained in the heavily thinned wood. Sixty-two per cent. of all the seed of both species was shed during day time, a fact that is explained by the prevailing conditions of relative air humidity and wind.

12.11 : 12.12 : 12.2. SMITH, E. C. **Sex expression in Willows.** *Bot. Gaz.* 101, 1940 (851-61). [Colorado College of Agriculture & Mechanic Arts, Fort Collins.] O.B.D.

The occurrence is reported of abnormal bisexual and intersex catkins in 9 species of Willow from the Rocky Mountain region. From a discussion of the causes of such abnormalities it is concluded that both external and internal factors may be responsible for the expression of bisexuality, which is normally inhibited by the genetic constitution.

12.11 : 12.2 : 22.2. AL'BENSKI, A. V. **Pitch Pine (*Pinus rigida* Mill.)**. *Priroda Akad. Nauk. S.S.S.R.* 1940 (3), (74-6). [R.] C.G.B.

From Russian experience to date it appears that coppice shoots of *P. rigida* are longlived and capable of growing into timber. They are also drought- and cold-resistant, but the timber produced is somewhat inferior to that of *P. sylvestris*. It is therefore suggested that an attempt be made to cross the two species with a view to combining coppicing ability with the production of quality timber.

12.11 : 12.2 : 21.6 : 23.25 (77.2). GRUSCHOW, G. F. **Performance of hybrid Poplar cuttings in the Forest Service nursery, Vallonia, Indiana**. *Sta. Note Cent. St. For. Exp. Sta.* No. 39, 1939. pp. 8.

Clones sorted out into a definite order in respect to increment and general behaviour during the first growing season, but no correlation was found, within the scope of the data, between planted diameter of cuttings and increment. Differential resistance of the clones to insect and fungous attack was manifested during the growing season in the nursery. Of the 25 clones tested four were affected by a leaf rust (*Melampsora* sp.) and thirteen suffered heavy insect attack. There was a noticeable variation in the time at which dormancy was broken by the various clones. There was no winter mortality or die-back of individuals left in the nursery bed over winter. *From author's summary.*

12.12. Pathology

12.12 : 11.12 : 11.14 : 23.27. WALLACE, R. H., and MOSS, A. E. **Salt spray damage from recent New England hurricane**. *Proc. nat. Shade Tree Conf.* 15, 1939 (112-9). [University of Connecticut.]

Among conifers, most injury from salt spray occurred in *Pinus strobus*, *P. sylvestris*, *Thuja* spp., *Juniperus*, and *Tsuga*, and least in *Pinus nigra* var. *austriaca*, *P. resinosa*, *P. rigida*, *Picea* spp., and *Taxus*. Damaged conifer foliage assumed a characteristic bright orange-yellow hue in all species, and where any injury was caused the tips of the needles were invariably killed. Most injury among broad-leaved trees was shown by *Acer platanoides*, *A. saccharum*, *Ulmus*, *Magnolia*, and *Liriodendron*. *Aesculus* appeared to suffer no damage. Injury to both classes of trees was very irregularly distributed. In general, broad-

leaved trees are recovering very well, due to the formation of fresh leaves from adventitious buds; conifers, on the other hand, show little recovery. [Cf. *For. Abs.* 2 (118)].

12.12 : 12.11 : 12.2. MOSHKOV, B. S. **Photoperiodism and immunity**. *C. R. Acad. Sci. U.R.S.S.* 19, 1938 (751-4). [E.] [Physiological Laboratory, All-Union Institute of Plant Industry, Pushkin.] O.R.S.

Infection of Black Currant leaves by *Cronartium ribicola*, as judged by the production of teleutospores, was found to be most severe with a photoperiod of about 13 hrs. Critical upper and lower limits, beyond which infection dropped rapidly to zero, occurred at photoperiods of 16 and 11 hrs., respectively. The incidence of flowering and fruiting in the host species had no effect upon this phenomenon, neither was there any correlation between the degree of infection and the duration and vigour of growth in the host, since the latter increased progressively with increasing photoperiods.

12.12 : 12.14. BENNETT, C. W. **The relation of viruses to plant tissues**. *Bot. Rev.* 6, 1940 (427-73). [Bureau of Plant Industry, U.S.D.A.]

12.12 : 12.2. BEATTIE, R. K. **Virus diseases of forest and shade trees**. *Proc. nat. Shade Tree Conf.* 15, 1939 (12-21). [Bureau of Plant Industry, U.S.D.A.]

A semi-popular discussion of virus diseases. Tree diseases so far known to be due to viruses are spike disease of Sandal, witches' broom of Black and Honey Locust, and phloem necrosis of Elm.

12.12 : 12.2 (57). MOURASHKINSKY, K. E. **Tinder fungi of the mountain forests of Siberia**. *Trans. Omsk Inst. Agric.* 17, 1939 (75-108). [R.] R.A.M. 19 (494-5).

List of 20 of the rarer Polyporaceae, with notes on their morphology, habitat, and world distribution.

12.12 : 12.2 (57). MOURASHKINSKY, K. E. **Tinder fungi of Siberia. II. On species attacking deciduous trees**. *S.-Kh. Inst. im. S. M. Kirova, Omsk.* 1940. pp. 27. [R.] R.A.M. 19 (495).

Annotated list comprising seven Polyporaceae found on deciduous trees in Siberia.

12.12 : 12.2. MILLER, P. W., BOLLEN, W. B., SIMMONS, J. E., GROSS, H. N., and BARSS, H. P. **The pathogen of Filbert bacteriosis compared with *Phytophthora juglandis*, the cause of Walnut blight.** *Phytopathology* 30, 1940 (713-33). [Bureau of Plant Industry, U.S.D.A.]

12.12 : 12.2 (74.1). WATERMAN, A. M., and ALDRICH, K. F. **Rehmiellopsis needle blight of Balsam Fir in Maine.** *Plant Dis. Repr.* 24, 1940 (201-5). [Bureau of Plant Industry, U.S.D.A.] L.S.

The symptoms are described of the needle blight of *Abies balsamea* caused by *Rehmiellopsis bohémica* Bub. & Kab., and a map is given to show the known distribution of the disease in Maine. The disease is very frequent in some parts of north-western Maine, and may be more widespread than present surveys indicate.

12.12 : 12.2 (68). LEDEBOER, M. S. J. **Developments in pathological research on Wattles.** *J. S. Afr. For. Ass.* No. 4, 1940 (30-45). [Division of Botany & Plant Pathology, Pietermaritzburg.]

A review of the work on gummosis, Albert Fall disease and root collar rot since November, 1938.

Gummosis:—Attempts at isolation disclosed no regularly or frequently present organism in diseased bark. Inoculation experiments with one bacterium and a *Diplodia* formerly isolated by another investigation, and bark grafting experiments initiated to disclose any virus infection that might be present have so far given no positive results. The inoculation of Wattle seedlings in sand and solution cultures with nodule bacteria has resulted in few nodules, but there are indications that nodules develop more readily in sand or solutions poor in nitrogen and benefit the seedlings to some extent, although nodules do not compensate for total lack of nitrogen.

Albert Fall disease:—Observations and isolation attempts failed to discover any parasite, although the manner of spreading suggests a parasitic cause. Time elapsing between first yellowing or withering symptoms and total withering of the tree may be only a few days. No earlier stages of the disease could be found.

Root collar rot:—From isolation attempts this appears to be a parasitic disease due to a fungus identified provisionally as *Rhizoctonia*. Inoculation experiments with this fungus have

given negative results so far. *From author's summary.*

12.12 : 12.2 (73). WEISS, F. **Acer section of revised Check List.** *Plant Dis. Repr.* 24, 1940 (190-201). [Bureau of Plant Industry, U.S.D.A.] L.S.

Fungal diseases of *Acer* and their causal agents are listed for the genus as a whole and for each species individually.

12.12 : 12.2 (74.4 : 74.5). CAROSELLI, N., and HOWARD, F. L. **Bleeding canker of Maples.** *Bull. Bartlett Tree Res. Lab.* No. 3, 1939 (44-8). R.A.M. 19 (570-1).

Various species of *Acer* grown as ornamental trees in Rhode Island and eastern Massachusetts have been severely damaged of late years by bleeding canker due to *Phytophthora cactorum*. In acute cases the trees may be killed in one to three years. The symptoms of the disease are described.

12.12 : 12.2 (7). JENKINS, A. E., and RAY, W. W. **A new host for *Taphrina dearnessii* and geographic distribution of *Taphrina* on North American Maples.** *Mycologia* 32, 1940 (408-14). R.A.M. 19 (625).

Taphrina dearnessii, recently described on *Acer rubrum* from Canada and the United States, has been found on *Acer spicatum* near Ithaca, N.Y. A map is given to show the present known distribution of *Taphrina* on Maples in North America.

12.12 : 12.2 (79.4). RAY, W. W. **A new species of *Taphrina* on Alder.** *Mycologia* 32, 1940 (155-8). R.A.M. 19 (502).

A new species, *Taphrina macrophylla*, is described from leaves of *Alnus rubra* in California. The young leaves become greatly enlarged, curled, and distorted, with a decided purple colour. After the ascospores are shed the leaves shrivel and fall, and a new crop of healthy leaves is produced.

12.12 : 12.2 (75.6). WOLF, F. A. ***Cercospora* leafspot of Red Bud.** *Mycologia* 32, 1940 (129-36). R.A.M. 19 (502).

A leafspot caused by *Cercospora cercidicola* is said to be the most conspicuous disease of *Cercis canadensis* in Duke Forest, N.C. The perithecial stage of the fungus, *Sphaerella cercidicola*, was also found and has been renamed *Mycosphaerella cercidicola* n. comb. The pathogenicity of the fungus and the genetic

connexion between the two stages was demonstrated in infection experiments.

12.12 : 12.2. MILBRATH, J. A. **A *Phytophthora* disease of *Chamaecyparis*.** [Abstract of paper read at the 1940 annual meeting of the Pacific Division of the American Phytopathological Society.] *Phytopathology* 30, 1940 (788).

A root rot of *Chamaecyparis*, first observed in 1938, is causing extensive losses in commercial and private ornamental plantings. Affected trees show progressive discoloration of the foliage, which becomes reddish brown when the tree is completely dead. The roots are already dead up to soil level when the discoloration of the foliage first appears. Inoculation tests with a species of *Phytophthora* isolated from diseased trees have established its pathogenicity. The species is apparently new and the name *P. lateralis* has been suggested for it.

12.12 : 12.2 (75.6). STEVENSON, J. A. **A *Meliola* on a new host genus.** *Plant Dis. Reptr.* 24, 1940 (325-6). L.S.

A fungus agreeing in morphology with *Meliola pinicola* Dearness, previously described from *Pinus echinata* in N. Carolina, has been found on *Juniperus virginiana* in the same State. This is the first record of *Juniperus* as a host for the genus *Meliola*. The fungus formed colonies not over 1-2 mm. in diameter, scattered mostly at or near the base of the needle.

12.12 : 12.2. NELSON, R. M. **Vigorous young Yellow Poplar trees can recover from injury by *Nectria* cankers.** *J. For.* 38, 1940 (587-8). [Appalachian Forest Exp. Sta.]

Measurements, covering a period of 5 years, of selected cankered Yellow Poplar (*Liriodendron tulipifera*) in a 15- to 20-year-old, heavily stocked stand showed that there was an unmistakable relation between tree vigour and crown class on the one hand and mortality and canker healing on the other. A big difference in the growth rate was noted between trees with healed and those with unhealed cankers. It is concluded to be fairly safe to select as crop trees infected Poplars that are dominant or codominant and of at least moderate vigour.

12.12 : 12.2 (75). WOLF, F. A. **A leafspot fungus on *Nyssa*.** *Mycologia* 32, 1940 (331-5). R.A.M. 19 (626-7).

An account of morphological studies on *Phyllosticta nyssae* Cooke, which is associated with a leaf-spot disease of *Nyssa sylvatica* and *N. biflora* in the south-eastern United States. *P. nyssae* is a spermatogonial stage, genetically connected with an ascigerous stage that grows on decaying leaves and reaches maturity the following spring. The ascigerous stage, originally described as *Sphaerella nyssaeicola*, is renamed *Mycosphaerella nyssaeicola* (Cooke) Wolf.

12.12 : 12.2 (73). LOHMAN, M. L., and CASH, E. K. ***Atropellis* species from Pine cankers in the United States.** *J. Wash. Acad. Sci.* 30, 1940 (255-62). [Bureau of Plant Industry, U.S.D.A.] L.S.

The description of the genus *Atropellis* Zeller and Goodding, based on the species *A. pinicola*, is amplified and emended to cover two new species, *A. tingens* and *A. arizonica*, and *Cenangium piniphilum* Weir, now known as *A. piniphila* comb. nov. All of these species cause characteristic cankers on *Pinus* in the United States, producing a localized dark stain of the wood in the affected parts. *A. tingens* is the most widespread, occurring on various native and introduced Pines in the eastern half of the country, and *A. arizonica* the most restricted, being known only from Salford, Arizona.

12.12 : 12.2 (73). WALTER, J. M., MOOK, P. V., and MAY, C. **Serious disease threatens the Sycamore or Plane tree.** *Arborist's News* 5, 1940 (49-55). [Bureau of Plant Industry, U.S.D.A.] L.S.

A general review of the *Ceratostomella* disease of Planes (*Platanus*) in the United States [cf. *For. Abs.* 2 (20)] from the arboricultural point of view. No satisfying control measures have yet been found, and all that can be done is to cut and burn infected trees and to sterilize pruning tools to prevent the spread of infection. It is hoped that resistant strains or hybrids may be developed in the future.

12.12 : 12.2 (75.1 : 76.8-9). MOOK, P. V. **Three new locations for the Sycamore (Planetree) disease.** *Plant Dis. Reptr.* 24, 1940 (205-6). [Bureau of Plant Industry, U.S.D.A.] L.S.

The *Ceratostomella* disease of Planes has been found on *Platanus acerifolia* in Delaware, and on *P. occidentalis* in Tennessee and Kentucky.

12.12 : 12.2 (71 : 73). BIER, J. E. **Studies in forest pathology. III. Hypoxylon canker of Poplar.** *Tech. Bull. Dep. Agric. Can.* No. 27 (*Publ.* 691), 1940. pp. 40. R.A.M. 19 (505).

Canker of *Populus tremuloides* and *P. grandidentata* due to *Hypoxylon pruinae* has been reported on many occasions in widely separated areas in Canada and the United States. The fungus invades the young bark and cambium of trunks and branches, forming cankers that girdle and kill the affected structures and all distal parts. In old trees the trunk cankers occur in the upper part of the bole, indicating that susceptibility depends on age of bark. Cankers are often found on healthy, rapidly growing trees, as well as on weakened ones. Near Toronto incipient cankers are always associated with wounds, punctures by a species of *Oobrya* beetle usually providing means of entry. Cankers grow faster along than around the stem or branches, and trunk cankers on 10- to 15-year-old trees are generally at least 3 ft. long before the trees are girdled. The fungus was isolated in pure culture from ascospores, conidia, and diseased bark. Inoculations of healthy trees with mycelium from these three sources gave positive results on wounded bark only. Trees 4 to 7 in. in diameter were girdled and killed 3½ years after inoculation. Observations are included on the biology of the fungus.

12.12 : 12.2 (79.4-7 : 71.1). HAHN, G. G. ***Dasyscypha* on conifers in North America. IV. Two new species on Douglas Fir from the Pacific Coast.** *Mycologia* 32, 1940 (137-47). R.A.M. 19 (503-4).

Dasyscypha pseudotsugae n. sp. occurs on suppressed trees of Douglas Fir, or on trees on poor sites, from California to British Columbia. It was found to be definitely associated with cankers and roughened bark of living trees, though no experiments were made to determine whether it was the cause of the cankers. Present observations suggest that the fungus and the cankers have little pathological importance. *D. ciliata* n. sp. is saprophytic on small shaded-out, dead twigs and branches, and occurs sparingly in the Pacific Northwest.

12.12 : 12.2. BOYCE, J. S. **A needle-cast of Douglas Fir associated with *Adelopus* [*Phaeocryptopus*] *gäumanni*.** *Phyto-*

pathology 30, 1940 (649-59). [Yale University.]

A general review of the literature summarized in *For. Abs.* 1 (69-71, 142, 238); 2 (20).

12.12 : 12.2 (77.3). CARTER, J. C. **Diseases of ornamental Oaks in Illinois.** *Arborist's News*, 4, 1939 (89-92). [Illinois State Natural History Survey, Urbana.]

The commonest diseases of Oaks in Illinois are a foliage disease caused by *Gnomonia veneta*, branch diseases caused by species of *Dothiorella*, *Coryneum*, *Cytospora*, *Nummularia*, and *Diatrype*, trunk diseases caused by species of *Polyporus*, *Fomes*, and *Fistulina*, and root rot caused by *Armillaria mellea*.

12.12 : 12.2 (73). KELSHEIMER, E. G., and MAY, C. ***Verticillium* wilt of Elm.** *Plant Dis. Repr.* 24, 1940 (282-4). [Bureau of Plant Industry, U.S.D.A.] L.S.

A species of *Verticillium* ranks third among the wilt-producing fungi found in Elm specimens submitted to the U.S. Department of Agriculture, being surpassed in frequency only by *Ceratostomella ulmi* and *Dothiorella ulmi*. It has been isolated from specimens sent in from 33 States extending from Oregon eastward to Maine, and from Minnesota southward to Louisiana, affecting about 5 per cent. of the total number of specimens submitted. The host species so far recorded include American and English Elms, and *Ulmus fulva*. Twigs and branches of diseased trees show sapwood discolorations appearing as complete or partial, solid or dotted brown rings in cross section, and as discontinuous streaks in the longitudinal plane, thus showing a similarity to the symptoms of Dutch Elm disease. Identification in culture is necessary for reliable diagnosis of the disease. A table is given of Elm specimens yielding the fungus, arranged by States.

12.12 : 12.2 : 13.2. MOSES, C. S., and HOFFMANN, C. H. **Isolation of *Ceratostomella ulmi* from *Scolytus multistriatus* adults stored at different temperatures.** *Phytopathology* 30, 1940 (701-2). [Bureau of Plant Industry, U.S.D.A.]

Material can be stored for a period of sixty days or less at any of the temperature conditions studied (70°, 60°, 40°, 28°, and -10° F.) without reducing the yield of the fungus in culture. For longer storage periods, up to 2½ years, a temperature of -10° F. was found

most satisfactory, the cultures of the beetles stored at this temperature giving the best results as to rapidity of coremial development and freedom from contaminants.

12.12 : 12.2 : 13.1 : 13.2 (71.3). BROWN, A. W. A. **Forest tent caterpillar in Ontario in 1931-1938.** *Rep. ent. Soc. Ont.* 69, 1938 [issued 1939], (37-42). R.A.E. A28 (418).

An account is given of an outbreak of *Malacosoma disstria* Hb. that occurred in Ontario during 1931-38. It is concluded that in this region new infestations develop more or less simultaneously in widely separated areas and that the outbreak moves steadily east-south-east in successive years, becoming less severe at the original centre. Peak infestation lasts for 3 years and is followed by a sharp decline. During this time increasing control is exerted by *Sarcophaga aldrichi* Parker, a muscardine fungus and wilt disease, while food shortage and late spring frosts also contribute to the collapse of the outbreak. Outbreaks are most likely to occur in extensive continuous areas of second-growth Poplar and Birch about 30-40 years old.

12.12 : 12.2 : 13.2 (71.4). MAHEUX, G. Dégâts typiques du *Paraclemensia acerifoliella* F. dans les érablières. [Typical damage by *P. acerifoliella* in Maple stands.] *Rev. Oka. Agron., Méd., Vét.* 14 (1), 1940 (41-3). [F.]. *Biol. Abs.* 14 (12690).

In an outbreak in Quebec in 1939 Maples (*Acer saccharum*) were heavily infested up to 20 ft. from the ground; all young trees and lower part of mature trees turned yellow. Despite heavy larval migration, associated species—Ironwood, Beech, Hemlock—were not damaged.

12.12 : 12.2 : 13.2 (91.4). UICHANCO, L. B. **Insect defoliators of *Cinchona* in Mindanao.** *Philipp. J. For.* 3, (1), 1940 (45-9). [University of the Philippines.]

Include *Pachyrrhynchus postpubescens* and seven species of *Metapocyrtus*. Attack was confined largely to seedlings growing in the open, even partial shade affording a high degree of protection from these insects.

12.12 : 12.2 : 13.2 (74). MACANDREWS, A. H. **The Pinespittle bug (*Aphrophora parallela* Say) as a pest of Scotch Pine plantations.** *Rep. ent. Soc. Ont.* 69, 1938 [issued 1939], (35-7). R.A.E. A28 (418).

An account is given of the history of *A. parallela* as a pest of Scots Pine in New England, and the bionomics of the insect are briefly described.

12.12 : 12.2 : 13.2 : 13.1 (485). FORSSLUND, K.-H. Ett massuppträdande av tallspinnaren i Värmland. [An outbreak of *Dendrolimus pini* L. in Värmland.] *Skogen* 27, 1940 (253-5). [Sw.]

In May 1939 a major outbreak of *D. pini* was discovered on Scots Pine at Sörmon, near Karlstad, the area affected being more than 700 ha. of productive forest land. There was reason to believe that infestation had already become severe in 1938. This is the first instance of an outbreak of the moth in Sweden, though it is sparsely distributed over the whole country and has at times caused serious damage to Pine in neighbouring regions of Norway. In the present case many trees had been completely defoliated and infestation was heavy over the whole area. Though the final effect upon the trees cannot yet be foreseen, a later examination showed that many of them had recovered to a surprising extent and none appeared to have been killed by the direct agency of the larvae. A minor infestation also occurred in Dalarna in 1938. The biology of the moth is discussed on the basis of the present case and of previous literature, and it is concluded that the evidence points to a normal life cycle of two years under Scandinavian conditions, in contrast to the one-year cycle that occurs on the Continent. Apart from empty puparia of a parasitic fly, which were found in the skins of small larvae, the only parasite bred out from larvae collected on the Sörmon site was *Exochilum circumflexum* L., which emerged from the pupae at the same time as the adult moths. It is emphasized that in view of the damage reported from Norway, and as the outbreak in Sweden is now in its third year, the future progress of the attack should be kept under close observation.

12.12 : 12.2 : 13.2 (73). SCHAFFNER, J. V. ***Neodiprion sertifer* (Geoff.), a Pine sawfly accidentally introduced into New Jersey from Europe.** *J. econ. Ent.* 32, 1939 (887-8). R.A.E. A28 (486-7).

Neodiprion sertifer has occurred in New Jersey since 1925, and by 1938 it was well established in 6 counties and had also been reported from Ohio and Michigan. Observations in New Jersey show that *Pinus resinosa*,

P. sylvestris, *P. densiflora*, *P. banksiana*, and *P. mugo* are the most favoured food plants. Light feeding was observed on *P. strobus* and *P. austriaca* where these Pines were growing near the more favoured species, but no larvae were found on *P. rigida*. Severe defoliation was reported in 1937 and the infestation has continued in epidemic form where control measures have not been used. The spread of the insect has been retarded by the scarcity of Pines round the locality where it was first established, and by the spraying programme carried out between 1921 and 1930 against *Lymantria dispar*. An account is given of the biology of the sawfly.

12.12 : 12.2 : 13.2 (79.4). FOWELLS, H. A. **Cutworm damage to seedlings in California Pine stands.** *J. For.* 38, 1940 (590-1). [California Forest & Range Exp. Sta.]

Cutworms (Noctuidae larvae) cause serious damage and often high mortality to seedlings, especially for one to two months after germination, of species such as Sugar Pine, Ponderosa Pine, Jeffrey-Pine, Incense Cedar, and White Fir. Selective feeding by these insects may affect the species composition of mixed stands.

12.12 : 43.3 (74.1-7). STICKEL, P. W. **The effect of basal wounding by fire on trees in the Northeast.** *Tech. Note Ntheast. For. Exp. Sta.* No. 30, 1940. pp. 2.

Annual examinations of sample plots over periods of 3 and 6 years showed that on the average more than 60 per cent. of the basal-scorched trees were adversely affected either by insect attack (first year), delayed mortality (second year), fungus attack (third year), or the formation of an open fire wound. The peak of occurrence varied with type of damage as indicated in brackets.

12.12 : 43.3 : 12.2. PRYOR, L. D. **The effect of fire on exotic conifers.** *Aust. For.* 5, 1940 (37-8).

Two factors that determine the survival of a tree after fire are bark thickness and ability to produce new foliage. Exotic conifers are listed in order of their ability to resist fire. Very resistant—*Pinus canariensis*. Resistant—*P. coulteri*, *P. ponderosa*, *P. caribaea*, *P. arizonica*, *P. apachea*, *P. pinaster*, *P. montezumae*, *P. jeffreyi*. Susceptible—*P. radiata*, *P. muricata*, *P. densiflora*, *P. torreyana*, *P. contorta*, *P. laricis*, *P. austriaca*, *P. sabiniana*, *P. sylvestris*, *Libocedrus decurrens*, *Cedrus libani*,

P. patula, *P. flexilis*. Very susceptible—*P. lambertiana*, *P. strobus*, *P. monticola*, *Pseudotsuga douglasii*, *Cedrus deodara*, *Sequoia gigantea*, *Picea alba*.

12.14. Morphology. Anatomy. Histology

12.14 : 12.2. DATTA, R. M. **On the hermaphrodite flowers of *Morus indica* Linn.** *Science and Culture* 5, 1939 (373-5). Pl. Sci. Lit. 12 (9), (15).

12.14 : 12.2. BUCHHOLZ, J. T., and KAEISER, M. **A statistical study of two variables in the *Sequoias*—pollen grain size and cotyledon number.** *Amer. Nat.* 74, 1940 (279-83). [University of Illinois.] L.S.

Significant differences were found in both pollen size and number of cotyledons. The mean pollen size of *Sequoia sempervirens* was $32.85 \pm .11\mu$, and that of *S. (Sequoiadendron) gigantea* $22.47 \pm .05\mu$. It is suggested that this difference may be correlated with the polyploid condition of the former species. The mean number of cotyledons was $2.09 \pm .02$ in *S. sempervirens*, and $3.69 \pm .03$ in *S. gigantea*.

12.14 : 12.2. CROSS, G. L. **Development of the foliage leaves of *Taxodium distichum*.** *Amer. J. Bot.* 27, 1940 (471-82). [University of Oklahoma, Norman.] O.B.D.

A brief description of the general anatomy of the mature foliage leaf of *Taxodium distichum*, followed by an extensive account of its developmental histology.

12.15. Mode of Life. Adaptability. Habit. Phenology

12.15 : 07.7. BYRAM, G. M. **A tree-crown profile projector.** *J. For.* 38, 1940 (629-31). [Appalachian Forest Exp. Sta.]

The essential parts of this instrument are: (1) a horizontal wooden bar with a graduated scale on one side, (2) a vertical glass plate, $4\frac{1}{2} \times 7\frac{1}{2}$ in., clamped in a holder which slides along the bar, and (3) a metal strip attached at one end of the bar and in which there are two eyepiece holes $\frac{1}{8}$ in. in diameter. To draw the profile the operator measures the distance between the base of the tree and the instrument, sets the sliding holder containing the glass plate at an equivalent distance on the scale of the bar, observes the tree through the pinhole sight and glass plate and traces the crown

profile on the glass. For ease of work and accuracy the instrument should be at a distance at least equal to the height of the tree, or at a distance at least 1.5 times the height of the tree if the instrument is supported only by hand.

12.15 : 12.11 : 12.2. ALLARD, H. A. **The Running Oak (*Quercus pumila* Walter).** *Ecology* 21, 1940 (421-2). [Bureau of Plant Industry, U.S.D.A.]

This species, which grows on the eastern coastal plain of the United States, bears fruit annually although belonging to the Black Oak group. From observations over a period of three years it appears that variation in length of daily light exposure from 10 to 15 hours made no difference in time of flowering or acorn maturity.

12.19. Geographical Distribution. Plant Geography and Sociology

12.19 : 01. CAMPBELL, R. S. **Chart quadrat computations.** *J. For.* 38, 1940 (737-9). [U.S. Forest Service.]

Ten counts were made by trained workers of the square centimeters covered by each of 41 grass tufts, ranging in size from one to 500 sq. cm., that were assembled on a test quadrat sheet. Points representing twice the standard deviation for the ten counts of each tuft were plotted and a free-hand curve drawn in to be used as a control in checking the accuracy of future computations.

12.19 : 11.6 (79.2). COTTAM, W. P., and STEWART, G. **Plant succession as a result of grazing and of meadow desiccation by erosion since settlement in 1862.** *J. For.* 38, 1940 (613-26). [Intermountain Forest & Range Exp. Sta.]

Since 1862, when the Mountain Meadows Valley in southwestern Utah was settled, there has been an almost complete change in the plant cover of this valley. Grasses, rushes and shrubs have largely disappeared following heavy grazing by cattle and sheep, and by 1884 the depletion of plant cover was such that heavy rains cut a deep wash through the entire length of the meadow. Rabbitbrush (*Chrysothamnus* spp.) has become established on burned areas, while on parts of the meadow bottoms a vigorous growth of Sagebrush (*Artemisia tridentata*) is found in dense stands. The invasion and replacement of Sagebrush

by Junipers (*Juniperus utahensis*) on the foothills is a further ecological change of importance that is going on rapidly at present. Controlled moderate grazing favours the increase of grass even in competition with Sagebrush, though on a more effective scale if the Sagebrush is first burned.

12.19 : 12.2 : 11.44. RABOTNOV, T. **The influence of Grey Alder (*Alnus incana* [L.] Moench) on the productivity of herbaceous plants.** *Priroda Akad. Nauk S.S.S.R.* 1939 (6), (72-3). [R.] C.G.B.

Observations in a number of forest regions on fairly dry sites revealed a superior development by weight of *Deschampsia caespitosa*, *Hypericum perforatum*, *Fragaria vesca*, *Calamagrostis epigeios*, and especially of the semi-parasite *Melampyrum nemorosum* growing under *A. incana* as compared with these species under several other types of tree cover. In the case of *D. caespitosa* the higher productivity was also evident from the greater number of sprouts per plant.

12.19 : 23.4 : 43 (79.5 : 79.7). ISAAC, L. A. **Vegetative succession following logging in the Douglas Fir region with special reference to fire.** *J. For.* 38, 1940 (716-21). [Pacific Northwest Forest & Range Exp. Sta.]

The plant association in the Douglas Fir region, when destroyed by fire, goes through four distinct stages of succession before it reaches the climax type, unless again interrupted by fire or logging. These stages are the 'moss-liverwort', 'weed-brush', 'intolerant even-aged Douglas Fir', and the 'tolerant all-aged Hemlock-Balsam Fir'; the last-named, so far as is known, will persist. The weed-brush stage is most subject to fire, and successive fires do prolong and can perpetuate this stage.

Colonies of exotic species are upsetting natural succession in some localities because they are unpalatable and more vigorous than native species. Grazing tends to eliminate palatable species and favours others like the exotics, bracken, and brush; however, many grasses have been introduced that have become naturalized and have improved grazing. The underground parts of some virgin forest ground-cover species survive fires and form a minor part of the weed-brush stage; the remainder is made up of invading species, the most important of which are bracken, fireweed, blackberry, and snowbrush. Some species run

their course and disappear, while others persist until they are crowded out by more vigorous brush cover and the oncoming forest. Light cover is beneficial to coniferous seedlings but heavy cover is detrimental, and the weed-brush stage often develops a density that practically prohibits forest regeneration. Successive fires impoverish the soil, favour the herbaceous species, retard the brush species, and eliminate from the succession the coniferous seedlings that would go to make up the new forest. *Author's summary.*

12.19.1. Regional Floras

12.19.1-2 : 09.7 (47.6). STANKOV, S. S. **On the mountain and steppe xerophytes of Southern Crimea in connexion with the geographical variability of Juniper forests between Laspi and Karadag [Karadagh].** *Bot. Zh.* 24, 1939 (518-27). [R.] A.P.B.

12.19.1 : 12.2 (494). DANSEREAU, P. Extension au Valais de l'aire du *Populus tremula* var. *freyni* Hervier. [Extension of the range of *Populus tremula* var. *freyni* to Valais.] *Bull. Soc. bot. Genève*, Ser. 2, 30, 1940 (221-9). [F.] L.S.

About 40 trees of this variety were found in the forest of Finges. A statistical analysis of leaf characters showed that the trees were remarkably uniform in this respect while the leaf type differed considerably from that of *P. tremula*.

12.19.1 : 12.2 (52). NAKAI, T. **Flora sylvatica koreana. XXII. Lauraceae, Smilacaceae.** Forest Experiment Station, Government General of Chosen, Keijyo, Japan. 1939. pp. 106. *Pl. Sci. Lit.* 12 (8), (15).

12.19.1 : 12.2 (67.8). BURTT, B. D. **A field key to the savanna genera and species of trees, shrubs and climbing plants of Tanganyika Territory. Pt. I. Genera and some species.** Govt. Printer, Dar es Salaam. 1939. pp. 53.

As indicated by its title, this is a simple and practical key based primarily upon field characters, many of which are not observable in the herbarium. Botanical terminology has been used as little as possible, and a glossary is provided for the technical terms that are unavoidable. The key is meant for use in one particular type of vegetation alone and is not applicable outside of that type.

12.19.1 : 12.2 (7). JAUQUES, H. E. **How to know the trees : all illustrated key to the most common species of trees found east of the Rocky Mountains, with suggestions and aid for their study.** The author, Mt. Pleasant, Ia. 1940. pp. 152. *Pl. Sci. Lit.* 12 (4), (20).

12.19.1 : 12.2 (75.9). SNYDER, E. **Florida trees. A practical handbook for the identification of Florida's trees and palms.** Geddes Printing House, Fort Myers, Fla. 1940. pp. 150. *Pl. Sci. Lit.* 12 (4), (21).

12.19.1 : 12.2 (76.1). PAGE, R. H., and BRYAN, J. E. **Forest trees of Alabama.** *Circ. Alabama Polytechnic Inst. Ext. Serv.* No. 169, 1939. pp. 72. *Pl. Sci. Lit.* 12 (2), (17).

12.19.1 : 12.2 (77.8). **Forest trees of Missouri.** *Conserv. Bull. Mo. Conserv. Comm.* No. 20, 1940 [?]. pp. 66.

Contains brief, non-technical descriptions of trees, leaves, bark, fruit, wood, and the range of tree within the State, together with illustrations of twigs, leaves, and fruit of each species.

12.19.1 : 12.2 (78). PRESTON, R. J. **Rocky Mountain trees. A handbook of the native species with plates and distribution maps.** Iowa State College Press, Ames. 1940. pp. 285. *Pl. Sci. Lit.* 11 (25), (20).

12.19.1 : 12.2 (96.9). ST. JOHN, H., and FOSBERG, F. R. **Identification of Hawaiian plants: I. A key to the families of Dicotyledons of the Hawaiian Islands, descriptions of the families, and list of the genera. II. A key to the families and genera of the Gymnosperms and of the Monocotyledons of the Hawaiian Islands, with descriptions of the families.** *Univ. Hawaii Occ. Pap.* No. 36, 1938 (1-53); No. 41, 1940 (1-47). *Biol. Abs.* 14 (12473).

12.19.2. Forest Types and Woodland Communities past and present

12.19.2 : 09.7 (47.6). DOLUKHANOV, A. **Forests of the basin of the Tchkhalta [Chkhalt] river (Abkhasia).** *Trudy Tbilisskogo Botanicheskogo Instituta* Ser. 2, 10 (5), 1938 (1-103). [R. georg. e.]

12.19.2 : 09.7 (47.6). TUMADZHANOV, I. I. **Forests of the Tushethia [Tushetiya] highland.** *Trudy Tbilisskogo Botanicheskogo*

Instituta Ser. 2, 10 (5), 1938 (105-248). [R. georg. e.]

12.19.2 : 09.7 (54.3). HEWETSON, C. E. **Note on the type of forest occurring in the higher parts of the Central Provinces.** *Indian For.* 66, 1940 (467-73).

This association is characterized by a larger proportion of the evergreen species of the Central Provinces than is usual. No species was found that is peculiar to the hills. The most prominent tree species is probably *Terminalia chebula* and other distinctive trees include *Eugenia jambolana*, *Mangifera indica*, *Mallotus philippinensis*, *Trema orientalis*, *Ougeinia dalbergioides*, *Careya arborea* and *Ficus* spp. These tree species together with certain shrubs represent the natural flora of the region under conditions of relatively high rainfall and are favoured by fire protection and the establishment of a dense canopy. Teak is absent from the association and in fact shows less vigorous growth from 2,500 ft. upwards.

12.19.2 : 09.7 (54.8). KRISHNAN, E. K. **Evergreens in Cuddapah.** *Indian For.* 66, 1940 (482-5).

Small areas up to 10 acres of dry evergreens are reported in a valley at 500 ft. elevation some 57 miles distant from Cuddapah. Evergreen species particularly noticeable in this association include *Plectronia didyma*, *Maba buxifolia*, *Memecylon edule*, *Hemicyclia sepiaria*, *Limonia alata*, *Atalantia monophylla*, *Linociera zeylanica*, *Ixora parviflora* and *Pterospermum suberifolium*. Other species include those commonly found in the deciduous forests.

12.19.2 : 09.7 : 61 (66.9). PATTULLO, M. L. **The vegetation map of Sokoto Province.** *Niger. For.* 1, 1940 (35-9).

Brief history of the survey.

12.19.2 (67.6). DALE, I. R. **The forest types of Mount Elgon.** *J. E. Afr. Ug. nat. Hist. Soc.* 15 (1/2), 1940 (74-82).

The vegetation types of Mt. Elgon, Kenya, are classified into: (i) Alpine elfin woodland, including (a) upper moorlands, (b) 'heath' zone, and (c) upper Bamboo transition forest. (ii) Montane Bamboo forest. (iii) Upper montane forest, subdivided into (a) mixed *Pygeum* forest, (b) lower Bamboo transition forest, (c) *Malacantha* forest, and (d) *Malacantha* and *Entandrophragma* forest. (iv) High montane conifer forest. (v) Savanna woodland.

The floristic composition of these types is outlined and a map is given to show their distribution.

12.19.2 : 09.7 (67.6). EDWARDS, D. C. **A vegetation map of Kenya with particular reference to grassland types.** *J. Ecol.* 28, 1940 (377-85). [Agricultural Department, Kenya.]

The vegetation of Kenya is predominantly grassland, and the forests are generally confined to the slopes of the larger mountain masses. The principal types of forest and grassland are described as to species composition and location, particularly in relation to topography and precipitation. The grasslands are divided into: 1. Grasslands, including parkland or savanna grasslands: (a) Mountain grassland, (b) high-moisture savanna and (c) Acacia/tall grass savanna and open grassland (tall grass). 2. Semi-arid grasslands: (a) Acacia/desert-grass savanna and open grassland (desert grass), and (b) desert shrub/desert grass.

The forest types include: 1. Mountain forest that occupies an area of some 6,000 sq. miles most of which is between 6,500 and 9,000 ft. on the mountain slopes. This type, which grows within a precipitation range of 35 to 90 in. per annum, appears to have two main subdivisions related to moisture conditions: (a) a high-moisture type that is found mainly on the eastern slope of the mountains growing under an annual rainfall of 55 to 90 in., and is characterized by the absence of *Juniperus procera* and largely dominated by *Ocotea usambarensis* and *Podocarpus milanjanus*. (b) A lower-moisture type under an annual rainfall of 35 to 55 in. and composed chiefly of *J. procera*, *P. milanjanus* (at high altitudes), *P. gracilior* (at lower altitudes), *Olea hochstetteri* and *O. chrysophylla*. Both types include many species of hardwoods. Bamboo (*Arundinaria alpina*) is found at the upper and moister edge of the mountain forest.

2. Thorn Forest is found in small scattered areas generally in the dry country of the Acacia/desert-grass savanna. *Acacia* spp. in association with *Boscia* spp., *Balanites aegyptiaca* and *Sansevieria* spp. is the vegetation characteristic of this type.

3. Mangrove forest is confined to a small area of swamps and is relatively unimportant.

12.19.2 : 09.7 : 23.3 (69). VESEY-FITZGERALD, D. **On the vegetation of Seychelles.** *J. Ecol.* 28, 1940 (465-83).

Three primary forest formations of Mahé and Silhouette Islands are described:—(i) Mountain moss forest, dominated by *Northea seychellarum* and *Neowormia ferruginea*, with a very conspicuous epiphytic flora of mosses, ferns, clubmoss, and orchids. (ii) Intermediate forest, dominated by bigger trees of the same two species and probably other top-storey species also. This type has been much disturbed and second-storey trees mostly predominate at the present time. (iii) Lowland forest, which has completely disappeared, being replaced chiefly by species common to most tropical shores.

Large-scale destruction of these forests, beginning at the middle of the 18th century, was most severe in the lower and middle zones and has been followed by an extensive growth of secondary forest and other communities. The principal of these are:—(i) Cinnamon coppice, composed of the introduced species *Cinnamomum zeylanicum* and practically restricted to Mahé. (ii) Agati (*Adenanthera pavonina*) woodland, chiefly on Silhouette Island. (iii) Tall fern-brake dominated by *Gleichenia linearis*, which may behave as a more or less permanent subclimax where drastic forest destruction has occurred. (iv) A close grass mat composed of *Panicum parviflorum*, which smothers almost every other plant. Certain recommendations are made for the restoration of forest conditions. Where the original canopy is intact it should be kept so by reserving the forest; where it is broken, but the soil still intact, natural succession should be aided and modified by planting the most valuable species and broadcast-sowing the secondary trees, combined with judicious removal of weed species. *Gleichenia* brake should be destroyed by cutting below the creeping rhizomes and rolling back the matted rhizomes and fronds into contour 'bunds' to expose the mineral soil for natural regeneration or direct sowing and simultaneously to check erosion. Regeneration should be done immediately, before *Panicum* invades the site. Where serious erosion has already taken place, counter-erosion measures should be instituted and almost any type of vegetation fostered in order to build up the soil again.

12.19.2 : 09.7 : 12.2 (82). PARODI, L. R. La distribución geográfica de los talares en la Provincia de Buenos Aires. [The geographical distribution of *Celtis spinosa* woods in the Province of Buenos Aires.] *Darwiniana* 4 (1), 1940 (33–56). [Span.]

12.19.2 : 09.7 (946). MARTIN, D. The vegetation of Mt. Wellington, Tasmania. The plant communities and a census of the plants. *Pap. roy. Soc. Tasm.* 1939, 1940 (97–124). L.S.

The area described consists of a dolerite sill, about 1,600 ft. thick, overlying sandstones and mudstones. The soils below 2,500 ft. are podsol types, high moor and skeletal types occurring at higher elevations. Rainfall varies with altitude from 24 in. to about 60 in. per annum. The plant formations are: (a) Eucalypt forest, which ranges from open forests of the drier low altitudes, through dense forests of large trees with an important tall shrub layer to stunted, fairly open montane-subalpine forest on the summit plateau; (b) microthermal rain forest, dominated by *Nothofagus* and *Atherosperma*, occurring as a gully flora in small patches in the upper parts of the large tree forests; and (c) the Austral-Montane formation, consisting of shrubberies, swamps and grassland and occupying the small area on the summit plateau not occupied by dwarf Eucalypt forest. The flora is discussed and compared with that of other upland sites in Australia and Tasmania.

12.2. Special [Systematic] Botany

12.2 : 12.12. WEHMEYER, L. E. The genus *Massariovalsa*. *Amer. J. Bot.* 26, 1939 (831–4). [University of Michigan, Ann Arbor.] O.B.D.

Cultural studies of 3 strains of *Massariovalsa sudans* (B. & C.) Sacc., the one good species of the genus, indicate differences considered to be of varietal rank. The strains from *Acer* and *Carya* produced a conidial stage identical with *Melanconiopsis inquinans* E. & E., while that from *Nyssa* produced no conidia but numerous perithecia. The genus is considered as a subgenus of *Melanconis*. From author's summary.

12.2 (73). BAXTER, D. V. Some resupinate polypores from the region of the Great Lakes. XI. *Pap. Mich. Acad. Sci.* 25, 1939 [issued 1940], (145–70). [University of Michigan.] L.S.

Descriptions of 10 polypores, including *Poria ferox* n. sp. from dead wood of *Juniperus monosperma* and *J. virginiana* in Arkansas and New Mexico.

12.2 : 01. ALPHIN, T. H. A descriptive study of varietal forms in *Buxus*. *Amer. J.*

Bot. 27, 1940 (349-57). [University of Virginia, Boyce.] O.B.D.

An attempt to devise an adequate system of identification for various forms of *Buxus* suggested the use of measurements of plants and leaves in the form of ratios: height of plant in terms of its diameter, and length of leaf in terms of width. Application of these mathematical relationships to 31 forms, including 4 species, indicates that the method may be useful as a simple and accurate expression of the differences between varieties and species of the genus. *From author's summary.*

12.2 (729.1 : 86-7). SEIBERT, R. J. **New names in *Cydistax* and *Tabebuia*.** *Trop. Woods* No. 63, 1940 (7-8).

Tabebuia chrysea Blake, from Colombia and Venezuela, becomes *Cydistax chrysea* (Blake) Seibert; and *Tabebuia crassifolia* Britton (*Tecoma dubia* C. Wright), from Cuba, becomes *Tabebuia dubia* (C. Wright) Britton ex Seibert.

12.2 (67.8). JACKSON, C. H. N. **Field notes on the species of *Brachystegia* and *Isobertinia* of Tanganyika Territory.** *J. S. Afr. Bot.* Jan., 1940 (33-40). [Department of Tsetse Research, Tanganyika Terr.]

12.2 (72 : 8). RECORD, S. J. **Some new names for tropical American trees of the family Leguminosae.** *Trop. Woods* No. 63, 1940 (1-6).

Fourteen new combinations are made in the names of Mimosaceae trees from tropical Central and South America. A new genus, *Marmaroxylon* Killip, is described to receive the species, *M. racemosum* (Ducke) Killip (*Pithecolobium racemosum* Ducke), which yields the wood known as Angelim Rajado or Bois Serpent.

12.2. HARRAR, E. S. **The Kimball Maple.** *J. For.* 38, 1940 (726-8). [Duke University.]

A formal description is given of *Acer macrophyllum* Pursh. var. *kimballi* var. nov., which is a comparatively rare variety found in the State of Washington.

12.2 (91). SYMINGTON, C. F. **Three Malayan species of *Bruguiera*.** *Malay. Forester* 9, 1940 (131-2).

The species *Bruguiera eriopetala*, *B. hainesii* and *B. gymnorhiza* may be difficult to distinguish unless the diagnostic characters of each are known. The most useful of these characters are tabulated for each species. The

vernacular names suggested for these species are Tumu Merah, Tumu Puteh, and Berus Mata Buaya respectively.

12.2 (59.3-9). **Contributions to the flora of Siam (Thailand).** *Additamentum* LIII. *Kew Bull.* 1940 (180-6).

Includes the description of *Cordia mhaya* Kerr, sp. nov., a large tree from Siam and Burma.

12.2. POYARKOVA, A. I. **Contribution to the knowledge of the Hawthorns of the Old World. *Crataegus azarolus* L. and the Hawthorns with yellow fruit and two stones of the section *Azaroli* Loud.** *Bot. Zh.* 24, 1939 (437-54). [R.e.] A.P.B.

12.2 GUYOT, H. Sur la différenciation systématique du *Fagus orientalis* Lipsky. [On the taxonomic differentiation of *Fagus orientalis*.] *Bull. Soc. bot. Genève*, Ser. 2, 30, 1940 (215-20). [F.] L.S.

Fagus orientalis and *F. sylvatica* are hard to distinguish by the morphological characters so far used, and the difficulty is increased by the occurrence of intermediate forms in the Crimea and Bulgaria. Specimens collected by the author in the latter country suggest that the shape of the nut may prove to be a valuable diagnostic character.

12.2 (72). MARTINEZ, M. Una nueva especie forestal (*Fagus mexicana* sp. nov.). [A new forest tree species, *Fagus mexicana*.] *An. Inst. Biol. Univ. Mexico* 11, 1940 (85-9). [Span.] Pl. Sci. Lit. 12 (8), (2).

12.2 (96). SUMMERHAYES, V. S. **The genus *Ficus* (Moraceae) in southeastern Polynesia.** *Occ. Pap. Bernice P. Bishop Mus.* 15 (21), 1940 (227-8). Pl. Sci. Lit. 12 (3), (6).

12.2 (72). MARTINEZ, M. Pináceas mexicanas; descripción de algunas especies y variedades nuevas. [Mexican Pines; description of several new species and varieties.] *An. Inst. Biol. Univ. Mexico* 11, 1940 (57-84). [Span.] Pl. Sci. Lit. 12 (8), (2).

Includes *P. herrerae*, n. sp. *P. oocarpa* var. *ochoterenai* and *manzanoi*, *P. strobilus* var. *chiapensis*, n. var.

12.2 (75.5). ALLARD, H. A. **A globose form of Pitch Pine (*Pinus rigida*) in Virginia.** *Rhodora* 42, 1940 (308). O.B.D.

A Latin diagnosis is given of *Pinus rigida* Mill. f. *globosa* f. nov., found as a single tree

near Hopewell Gap, Bull Run Mountain, Virginia. The tree was 7 ft. 6 in. high. with a crown spread of 12 ft. and a diameter at ground level of 6.5 in.

12.2 (54.1). **Plants new to Assam. XII.** *Kew Bull.* 1940 (194-8).

Includes the description of *Radermachera borii* C. E. C. Fischer, sp. nov., a tree from the Naga Hills.

12.2 (51). LOUKASHKIN, A. S. **The small-leaved Elm of North Manchuria (*Ulmus pumila*).** *China J., Shanghai* 32, 1940 (153-7). *Pl. Sci. Lit.* 11 (24), (5).

12.2 (77.4). BOWMAN, A. B. **Chinese Elm in Michigan.** *J. For.* 38, 1940 (732-3). [Michigan State College.]

Eight plants of *Ulmus pumila* were set out in 1916 and 1917 and have averaged $\frac{3}{8}$ in. diameter growth per year for 24 years. Besides the advantages of rapid growth this species is resistant to drought, wind and extremes of heat, it will grow on a wide variety of sites, is easily propagated from stem or root cuttings or from seed, and suffers little from insect pests or diseases. Disadvantages include excessive seed production, the dropping of leaves and twigs later than other trees, susceptibility to ice damage owing to brittleness of the wood, and widely spreading roots, which penetrate the sod layer and sewer tiles.

13.1. General Zoology

13.1 : 13.2 (47.1). LOVÁSZY, P. **Some notes on the insect parasites of *Diprion polytomum* Htg. (Hymen., Tenthredinidae).** *Ann. ent. fenn.* 5 (3), 1939 (225-33). R.A.E. A28 (453-4).

Of 100 larvae of *D. polytomum*, collected in August 1939 in Finnish Lapland, 22 and 7 were parasitized by the Ichneumonids *Lamachus* sp. and *Holocremnus ratzeburgi* Tschek., respectively, and 5 and 6 by Tachinids identified as *Sturmia inconspicua* Mg. and *Ptychomyia selecta* Mg., respectively.

13.1 : 13.2 (71). BROWN, A. W. A., and FLEMING, H. S. **Recent extensions of the known distribution of the European Spruce sawfly.** *Rep. ent. Soc. Ont.* 69, 1938 [issued 1939], (22-4). R.A.E. A28 (440).

13.1 : 13.2 : 45.3 (71). REEKS, W. A. **Native insect parasites and predators attacking *Diprion polytomum* (Hartig) in Canada.**

Rep. ent. Soc. Ont. 69, 1938 [issued 1939] (25-8). R.A.E. A28 (416).

None of the indigenous parasites of the Spruce sawfly in Canada appears to be of any importance, the degree of parasitism by such species being only 0.018 per cent. Predators, which include Pentatomids of the genus *Podisus* and an Elaterid, are of some importance but do not appear to be a major factor in natural control.

13.1 : 13.2 (71). BARCLAY, J. M. **The oviposition habits of some of the species of the genus *Exenterus* parasitic on sawfly larvae.** *Rep. ent. Soc. Ont.* 69, 1938 [issued 1939] (29-31). R.A.E. A28 (416).

13.1 : 13.2 (71). GREEN, T. U. **A laboratory method for the propagation of *Microcryptus basizonus* Grav.** *Rep. ent. Soc. Ont.* 69, 1938 [issued 1939], (32-4). R.A.E. A28 (416-7).

A technique is described for removing eggs of *M. basizonus* from cocoons of *Diprion polytomum* and implanting them in fresh cocoons. The method was evolved to avoid waste of host cocoons and loss of parasites due to the fact that under laboratory breeding conditions *M. basizonus* tends to lay several eggs in one cocoon.

13.1 : 13.2 (71). FINLAYSON, L. R. **A note on the mating of *Coelopisthia nematocida* (Pack.) Hewitt [a parasite of *Pristiphora erichsoni* and *Diprion polytomum*].** *Rep. ent. Soc. Ont.* 69, 1938 [issued 1939], (34-5). R.A.E. A28 (417).

13.1 : 13.2 : 31.43 : 12.2 (931). JEFFREYS, F. J. ***Hexatricha pulverulenta* Westwood.** *Trans. roy. Soc. N.Z.* 69 (3), 1939 (347-60); *Cawthron Inst. Publ.* No. 46A. [Cawthron Institute.] P.R.

H. pulverulenta is a small native longhorn beetle found on *Nothofagus* and the exotic *Pinus radiata* throughout New Zealand. The present paper contains a description of its external anatomy and reproductive organs, with short notes on habits and life history.

13.1 : 13.2 : 07.7. KUZ'MANENKO, N. E. **A mechanical sieve for determining the cockchafer population of soils.** *Lesnoe Khozyaystvo, Moscow* 1940 (6), (69-70). [R.]

The design presented is claimed to be 5-6 times more efficient than hand work. Cost 200-250 roubles (approx. \$20-25).

2. SILVICULTURE

2 : 07 (66.9). LAMB, A. F. A. **Current silvicultural work at Sapoba.** *Niger. For.* 1, 1940 (10-5).

Present studies are conducted on an experimental working-plan scale and aim at evolving low-cost improvement technique mainly for (1) clean high forest (*Gossweilerodendron* and *Cylicodiscus*), (2) high forest with creepers (*Terminalia* spp., *Triplochiton*, *Antiaris*, and *Pycnanthus*), and (3) low forest with creepers (*Albizia* or *Musanga*). Silvicultural work in the high-forest types includes creeper cutting, poison girdling of unwanted species, and clearing and planting of stump sites. Creeper cutting works out at about 8½d. per acre and benefits high forest with creepers by increasing accessibility, stimulating regeneration, and improving crown development of the middle storey. The effect of poison girdling on regeneration is complex and appears to depend largely on amount of regeneration present previous to treatment, number of trees poisoned and stand density. The cost of stump-site clearing and planting is still fairly high but recently use of 'bush' nurseries has cheapened plant production. Such nurseries are temporary and are located in thinned-out forest close to the coupe. Preparation for planting works out at about £3 per 0.6-acre nursery, stocking—mostly with plants gathered in the forest—at about £4 for a stock of some 50,000 plants, annual maintenance at from £6 to £7. The low forest is treated in a *taungya* system characterized by the use of bush nurseries, by wider and less rigid espacement than is standard practice, and by mixture of species to include (1) fast-growing trees with spreading crowns, which reduce the need for cleaning, and (2) species of different growth rate to minimize subsequent thinning. The aim is to simplify the application of *taungya* over large areas by reducing the need for after-treatment.

2 : 45.3 : 12.2. JACKSON, W. E. **Growing Black Locust trees.** *Circ. Ky. Coll. Agric. Ext. Div.* No. 333, 1939. pp. 10.

A popular circular for farmers, containing information on procuring planting stock, raising home-grown plants, planting—including planting for erosion control, cultivation and care of the stand, time of felling, and insect enemies and their control.

21. SILVICULTURAL CHARACTERS OF TREE SPECIES

21 : 23-4 : 12.2 (91.4). CRUZ, E. DE LA, and CHINTE, F. O. **Akle in plantation.** *Philipp. J. For.* 3 (1), 1940 (7-43). [Bureau of Forestry, Philippines.]

From a silvicultural study of Akle (*Albizzia* *acle*) in nursery and plantation from 1910 to 1939 it was observed that: (1) Under natural conditions this species occurs on a large range of sites varying in topography, soil quality and moisture, climate, stand density and exposure to light. In general, the crowns develop towards the source of light. (2) Trees 25 years old vary from 5-16 m. in height and 4-23 cm. in diameter depending on conditions for growth. Height growth is greater in dense stands than in open stands. (3) The growth in heartwood at the stump increases with increase in diameter. (4) The germinative capacities of Akle seeds sown in different media, including soil stratified with moist sand, soil with carabao and horse manure, sand, sterilized soil, humus, soil with ashes, soil with lime, and direct seedings, were all poorer than of those in the control (clay loam) with a 31 per cent. germinative capacity, while mulching the surface soil with Kogon grass 1-2 in. thick resulted in a 96 per cent. germinative capacity. (5) The germinative capacity of the seeds treated before sowing were as follows: exposing the cotyledons by making holes 72 per cent., testa reduced in thickness 68 per cent., soaked in water from 8-18 hours 42 per cent., soaked in lye for 18 hours 40 per cent., scalding or boiling 17 per cent., and burning with grasses 15 per cent. (6) Planting stock 1-5 months old showed higher percentages of survival than did older seedlings and transplanting showed highest percentage of survival when done in August and September. (7) Mixed planting with fast-growing species resulted in early suppression and delayed growth while cleaning and thinning accelerated the growth of Akle. (8) The species bore flower and fruit throughout the year in different localities, but more cases were observed during the months of January to April or during the period of less precipitation. Natural reproduction was found within the periphery of the crown and was generally scarce. (9) High mortality of this species in plantation was caused by unfavourable site

conditions, competition and unintentional cutting while cleaning. *From authors' summary.*

21.1 : 11.11 : 12.2. CROMER, D. A. N. **The frost resistance of Hoop Pine.** *Aust. For.* 5, 1940 (13-5).

Tubed stock of Hoop Pine (*Araucaria cunninghamii*) was entirely unaffected by temperatures as low as 23° F. and small stock withstood temperatures down to 17° F. Stock used in the test included both 1-year-old and 2-year-old, the latter tubed both 2 and 12 months. The more recently tubed stock showed a higher resistance to cold. [Cf. *For. Abs.* 1 (155).]

21.4 : 21.3 : 11.47 : 12.2. CHADWICK, L. C. **The distribution of roots of Moline Elms in relationship to fertilizer application.** *Proc. nat. Shade Tree Conf.* 15, 1939 (38-51). [Ohio State University.]

A study of root distribution in 8-year-old transplants of Moline Elm (a horticultural variety of *Ulmus americana*), unfertilized or treated with various fertilizers.

21.6 : 11 : 12.19.2 : 12.2 (74.2). SMITH, L. F. **Factors controlling the early development and survival of Eastern White Pine (*Pinus strobus* L.) in central New England.** *Ecol. Monogr.* 10, 1940 (373-420). [Kansas State College of Agriculture & Applied Science.]

Three stations were set up in a forest of the natural White Pine type in New Hampshire. The sites of the three stations differed chiefly in the character of the overwood. Station 1 was established in a dense irregular-aged pure White Pine stand, station 2 in a partly cutover stand in the 41- to 60-year age class, and station 3 in a clear-cut area that had formerly been covered with Pine and some Hemlock and hardwoods. At each station a number of quadrats representing two surface conditions, natural litter and mineral soil, were sown with equal quantities of White Pine seed.

The physical factors influencing seedling growth were directly affected by degree of exposure at the 3 stations. The most important of these factors were: (1) Solar radiation: The average light intensity at the full-canopy station was about 7 per cent. of full sunlight, while at the part-canopy station radiation was about 22 per cent. in 1933 and 43 per cent. in 1934 of that in the open on clear days. One-year seedlings grown in full shade were about 15 per cent. as large as those in the open when

compared on a basis of dry weight. Plants in part shade were approximately 41 per cent. as large as those in the open. Seedling development indicated that when other factors were favourable White Pine seedlings increased in growth rate in direct proportion to the amount of radiation available. Although many seedlings in full shade survived two growing seasons, inadequate radiation lowered plant vigour so seriously that their chances of ultimate survival were seriously reduced. (2) Surface temperature: On litter-surface quadrats no surface temperatures above 120° F. were recorded at the full-shade station during the two seasons. Greater exposure at the part-canopy station resulted in 17 days with surface temperatures above 120° F. and 4 days that exceeded 135° F. Critical temperatures were more common in the open, and more common on litter surface than on exposed mineral soil. At the part-shade station 10.8 per cent. of the plants were killed by heat and 46.6 per cent. in the open. This factor was the major single agency in mortality in the open. (3) Soil temperature: The shading effect of the canopy resulted in a reduction of soil temperature at a depth of 2 in. at the timbered stations. The mean soil temperature was lowered about 2.5° F. at the part-shade station and 8° F. at the full-shade station. (4) Soil moisture: During dry periods the available moisture in the upper 3 in. of soil was lowest at the full-canopy station where available water was below the wilting coefficient for several weeks during the summer and mortality due to drought accounted for 11.4 per cent. of all seedlings in full shade. Moisture conditions were somewhat better at the part-canopy station where drought mortality accounted for 3.3 per cent. of the seedlings, and at the clear-cut station soil moisture in the upper 3 in. remained above the wilting coefficient throughout the two growing seasons and drought mortality accounted for only 2.1 per cent. of the seedlings.

The shading effect of canopy was favourable to germination throughout the summer while in the open high evaporation restricted germination to a short period at the beginning of the growing season. The comparative germination figures per quadrat in 1934 were 773 seedlings in full shade, 298 in part-shade and 227 in the open. The mineral soil surface was more favourable to germination than the litter surface and this influence was found to be most effective in the open where an average of 9

seedlings per quadrat appeared on litter in contrast with 560 on the exposed mineral surface.

Rodents were the major biotic factor in mortality. They destroyed 13.3 per cent. of the plants in full shade, 3.1 per cent. in part shade, and 1.8 per cent. in full sun. Fungi were responsible for 4.0 per cent. of the seedling losses in full shade, 0.7 per cent. in part shade and no loss in the open. *From author's summary.*

21.6 : 24.25 : 24.36 : 12.2. SCHANTZ-HANSEN, T. **Some notes on lateral growth of Jack Pine crowns.** *J. For.* 38, 1940 (598-600). [University of Minnesota.]

Measurements of crown spread in 40-year-old Jack Pine show little relationship between number of trees and crown density, while similar measurements in thinned plots and check plots, ten years after thinning, show that the thinned plots had not reached the probable crown density which they had before thinning. Measurements of lateral growth of Jack Pine crowns in five locations in Minnesota show an exceedingly slow rate of growth. *From author's summary.*

21.6 : 56-7 : 12.2 (76.4). **Tall Pines from little seedlings : An analysis of Slash Pine cultivation conducted by the Texas Forest Service.** *Sth. Pulp Paper J.* 3 (3), 1940 (15-6).

A small plantation of Slash Pine established in Texas, west of the natural range for this species, has shown an average diameter increment of about $\frac{1}{2}$ in., an average height growth of over 3 ft. and an average volume increase of 1.2 cords per year for the thirteen years since establishment. The 1-year seedlings were planted at a 6 × 8 ft. spacing on a low site with a sandy clay soil containing iron ore gravel. Tests indicate that seedlings of this species are more vigorous when grown in unshaded rather than shaded seedbeds. Further experimental plantations of the species have been established in eastern Texas in recent years.

21.7 : 12.12 : 11.12 : 23.27. ALDEN, P. E. **What the summer has taught us about hurricane damage.** *Proc. nat. Shade Tree Conf.* 15, 1939 (100-9). [N.J. Federation of Shade Tree Commissions.]

The following list is given of commonly planted shade trees, in decreasing order of wind resistance: *Quercus palustris*, *Q. rubra*, *Ginkgo biloba*, *Ulmus americana*, *Tilia cordata*, *Platanus acerifolia*, *Acer platanoides*, *A. rubrum*, *Gleditsia triacanthos*, *Acer saccharum*. The worst wind damage occurred in *Salix*, *Ulmus pumila*, *Populus*, *Acer saccharinum*, and *Aesculus*. General information is given on the treatment of wind-damaged trees.

21.7 : 31.8 : 12.2 (942). FIELDING, J. M. **Leans in Monterey Pine (*Pinus radiata*) plantations.** *Aust. For.* 5, 1940 (21-5).

At Mt. Burr, in the south-east of South Australia, all *Pinus radiata* plantations have a lean towards the south-east, a general lean being observed even when the plantation has been established only one year. Measurements of all trees on one acre of a 24-year-old plantation showed 97.2 per cent. of the trees to be leaning, with 95.2 per cent. leaning towards the south-east. Of the other Pines planted in this area including *P. canariensis*, *P. caribaea*, *P. muricata*, *P. pinaster* and *P. laricio*, only the last-named does not develop a general lean. Leaning trees are elliptical and have eccentric pith, they usually have sweeps or curves in their trunks, and compression wood occurs on the lower side of the stem. *From author's summary.*

21.9 : 12.2. KEEN, F. P. **Longevity of Ponderosa Pine.** *J. For.* 38, 1940 (597-8). [Bureau of Entomology and Plant Quarantine, U.S.D.A.]

Age determinations of Ponderosa Pine in eastern Oregon show that individuals reach ages in excess of 750 years. The oldest trees examined had been suppressed and slow-growing all their lives, were found on the poorer sites, and in some cases had survived a number of fires. Sixty per cent. of the sample trees from which ring counts were made were over 300 years old.

22. SYSTEMS OF MANAGEMENT. FORMS OF STAND. SILVICULTURAL SYSTEMS

22 : 32.2 : 12.2 (79.5 : 79.7). HILDMAN, A. T. **Cutting practices in the Ponderosa Pine region of the Northwest.** *J. For.* 38, 1940 (692-4). [J. Neils Lumber Co.]

Present knowledge indicates that light selection cuttings are the method best adapted to sustained-yield management in Ponderosa Pine. By this system some 40-50 per cent. of the original stand volume, consisting of the mature and overmature trees, which at the same time

are the largest and most valuable, is removed. As a result the growth of the residual stand is accelerated, mortality losses are reduced, and the threat of beetle infestation and loss through drought are lessened. The length of the cutting cycle is suggested as 30–40 years.

22 : 32.2 : 12.2 (79.5 : 79.7). HANZLIK, E. J. **Cutting practices in the Douglas Fir type, Western Washington and Oregon.** *J. For.* 38, 1940 (686–8). [U.S. Forest Service.]

Cutting practices based on the experiences of the writer. It is suggested that in the mature Douglas Fir type some form of clear cutting is desirable as residual stands do not benefit from release and are more often adversely affected, and Douglas Fir will regenerate only on relatively open sites. Operations in young second-growth stands should be confined to improvement cuttings while in the older second-growth stands a regeneration cutting of 40–45 per cent. of the merchantable volume 10 or 15 years before the final cutting should result in satisfactory establishment of Douglas Fir reproduction. Slash burning is not considered necessary silviculturally though it is usually an essential requirement for fire protection.

22 : 32.2 : 12.2 (79.5 : 79.7). JACOBSON, N. G. **Cutting practices in the mixed Douglas Fir, Hemlock, and Cedar forests of the Pacific Northwest.** *J. For.* 38, 1940 (688–91). [St. Paul & Tacoma Lumber Co.]

The stand characteristics of the three species Douglas Fir, Western Red Cedar (*Thuja plicata*) and Western Hemlock (*Tsuga heterophylla*) are described briefly. It is maintained that selection cutting is not necessarily the proper system for this region and that clear cutting can be good silviculture if certain precautions are taken to ensure seed supply, utilize fully the available wood, and give effective fire protection to the area after cutting.

22.2 : 12.2 : 12.15. BUELL, J. H. **Effect of season of cutting on sprouting of Dogwood.** *J. For.* 38, 1940 (649–50). [Appalachian Forest Exp. Sta.]

It is concluded that sprouting of Dogwood will be kept at a minimum by cutting the trees in July or early August. On the other hand, if it is desirable to reproduce Dogwood by sprouts the trees should be cut during the late winter, particularly in March.

22.22 : 23.25 : 23.7 : 12.2 (77.7). JORANSON, P. N., and KUENZEL, J. G. **Control of sprouting from White Oak stumps.** *J. For.* 38, 1940 (735–7). [Central States Forest Exp. Sta.]

Covering White Oak stumps with slash following cutting appears to be effective in reducing the number of stump sprouts, thus concentrating increment on fewer stems that will be useable in a shorter time. Slash piled to a depth exceeding 2 ft. may however cause the sprouts to grow along the ground until they reach the edge of the pile.

23. FORMATION OF STANDS

23–4 : 12.2 (91.4). ALTAMIRANO, G. M. **Growing Benguet Pine in Bukidnon Province.** *Philipp. J. For.* 3 (1), 1940 (51–67). [Cinchona Reforestation Project, Impalutao, Bukidnon, Philippines.]

It is concluded that Bukidnon Province, where the supply of firewood is inadequate, is suitable for the growth of Benguet Pine (*Pinus insularis*). This species, which is one of the two Pine species endemic in the Philippines, is briefly described, and nursery and planting technique and the care of young plantations are discussed. In this region sowing should be done in January or February and planting, by the trench method if possible, is carried out from June to August. Best results are obtained from planting stock raised in baskets made of grasses or palm leaves. Benguet Pine may be useful as a nurse crop in exposed areas and in that case should be planted 5 or 6 m. apart.

23.1. Natural Formation of Stands

23.1 : 12.2 (54.2). RAYNOR, E. W. **Sal regeneration de novo.** *Indian For.* 66, 1940 (525–9).

Comments are made on a recent article by Warren [*For. Abs.* 2 (130)]. It is pointed out that papers by Smythies [*For. Abs.* 1 (254); 2 (130)] apply only to a particular type of Sal forest in the United Provinces and that the special difficulties of regeneration in this type are not met with in another type similar to that prevailing in Singhbhum. Though burning may not be the best or only method of replacing heavy evergreen undergrowth by a more open cover of *Imperata* and *Clerodendron*, it is the cheapest method in the United Provinces, and sufficient seedlings survive to build up the necessary stocking of regeneration. Leaf litter,

which is destroyed by burning, is definitely inimical to Sal regeneration in the United Provinces. The Sal regeneration problem in this region is not entirely due to climatic causes, but also to excessive fire protection in former years, which favoured a succession towards the true climax forest, where conditions are unfavourable to regeneration. Finally, excessive weed growth results in the United Provinces from drastic opening of the canopy unless sufficient 'whippy' Sal regeneration has been obtained.

23.1 : 21.1 : 21.3 : 11.43 : 11.44 : 12.2 (485). HESSELMANN, H. Granens förnygringssvårigheter på örtrik mark och dess orsaker. [**Difficulties and their causes in the regeneration of Norway Spruce on sites with a rich herbaceous ground flora.**] *Bot. Notiser* 1939 (413-22). [Sw.] L.S.

The failure of Norway Spruce regeneration on soils bearing a rich herbaceous ground flora was generally regarded as due to insufficiency of light, but this view has been contested by Lindquist [*Svenska Skogsvåringsfören. Tidskr.* 30, 1932 (7-38)], who attributes the trouble to soil factors, particularly to a high degree of nitrification in the humus carpet. To obtain clearer evidence the author raised extensive pot cultures under the conditions described in Björkman's report on the mycorrhizal aspect of the problem [*For. Abs.* 2 (11-2)]. In these tests no perceptible connexion was found between seedling mortality and the degree of natural nitrification of the soils, but mortality was strongly correlated with lack of light. Mean shoot weight varied with both light and soil; the variation on different soils was slight at the weakest light intensities used, but increased progressively with increasing light. In general, the growth of the seedlings showed a good positive correlation with soil nitrification. Mean root weight was even more responsive to varied light, root development being extremely poor at low light intensities. Soil, however, had little effect on the roots, and, provided that adequate light was given, the root systems developed normally regardless of the degree of nitrification. Cultures to which ammonium nitrate was added showed that below certain limits high nitrogen concentrations had no harmful effect upon the plant as a whole, though the root system tended to develop less strongly with increasing access to nitrogen. With adequate light, dosages up to 200 mg. of

nitrate nitrogen per litre of soil improved growth and did not increase mortality. Above this level mortality increased, but the concentrations in question are enormously greater than any occurring in the natural soils. The results thus confirm the view that light is a decisive factor for Spruce seedlings on sites with luxuriant ground vegetation, as it is also for the formation of mycorrhiza [cf. Björkman, *loc. cit.*], and it is suggested that poor assimilation due to insufficiency of light may even prove to be a cause of the correspondingly poor mycorrhizal development. Though light is the chief factor, others seem to be involved, since the presence of *Oxalis acetosella* in the cultures not only prevented seedling development but also greatly reduced germination, which in the absence of this plant was uniformly good, regardless of light intensity. The presence of *Oxalis* also retarded growth and increased mortality in deciduous seedlings such as those of Bird Cherry, Ash, and Rowan grown in weak light. The nature of this inhibiting effect needs further investigation.

23.1 : 23.4 : 12.2 : 12.19.2 (74.1-3). WESTVELD, M., and SNOW, A. G. **Reproduction conditions on cut-over old-field Spruce stands in New England.** *Tech. Note Ntheast. For. Exp. Sta.* No. 32, 1940. pp. 2.

Most of the areas examined showed a satisfactory amount of coniferous reproduction although more than 85 per cent. of it was Balsam Fir and only 11 per cent. Spruce. Hardwoods are rapidly becoming established on these areas and are represented by nearly as many seedlings per acre as are the conifers (5379 and 5744 respectively). These relatively fast-growing hardwoods are overtopping the conifers and hindering their normal growth. Reproduction is sparse or absent on areas occupied by dense coniferous slash.

23.11 : 22.12 : 12.2 (54.2). HALL, W. T. **Two notable examples of natural regeneration under the uniform system.** *Indian For.* 66, 1940 (425-9).

An almost pure Oak forest (*Quercus incana* common at low altitudes and *Q. dilatata* at higher altitudes) occurring between 6,500 and 7,500 ft. in the Mukteswar forests of Kumaon was put under the uniform system in 1917 and first seeding fellings were completed ten years later. By 1938 a complete and profuse regeneration of Oak, with an average height of 15 ft., had become established over the area.

Regeneration cuttings were carried out from 1918 to 1924 in an area of Chir (*Pinus longifolia*), 1,400 acres in extent, situated near Garkhet in the South Khabdoli Block of East Lamora Division. By 1932-33 the regeneration was 80 per cent. complete, dense and 4-10 ft. high. At that time final fellings were made.

23.2. Artificial Formation of Stands. Artificial Regeneration

23.2-3 : 02 (75.6-9 : 76.1-8). **Planting and nursery handbook.** U.S.D.A. Forest Service, Southern Region, Atlanta, Ga. pp. 124. [1939?]

This book is supplementary to the National Forest Manual of the U.S. Forest Service and contains detailed instructions on planting and nursery practice in establishing forest plantations, particularly in Region 8 (southern).

23.2 : 22.22 : 33.7 (54.8). GRIFFITH, A. L. **A note on the artificial regeneration of the dry fuel forests of the Madras Province.** *Indian For. Rec.* (n.s.) *Silviculture* 3, 1940 (291-322 + vii).

The dry fuel forests of Madras total roughly 900,000 acres in reserved forest alone, with an annual cut of about 30,000 acres which produces an annual revenue of Rs.400,000. They are essentially 'local' forests and supply the villager with fuel, agricultural implements, small building timber, grazing, &c. Outside of the reserves they have either disappeared or are rapidly disappearing under the ravages of man and his animals (chiefly goats). In the reserves they are worked in general on a 30-year rotation, now in many cases being raised to 40 years, by the simple coppice system. At each coppicing the mortality of stools is 5-10 per cent., and this is not being replaced by natural regeneration. During the past 10 years it has been shown that artificial regeneration can be done with certainty of success and at a reasonable cost, even under the poorest conditions, by the 'rab' method (artificial regeneration in patches or strips, usually after slash burning), and at practically no cost by the 'rab-kumri' method (i.e. in conjunction with field crops). In 1937 'rab' regeneration was undertaken on 6,500 acres and 'kumri' on 1,200 acres, the total representing 26 per cent. of the annual cut. Both methods are extending more and more each year. *From author's summary.*

23.21. Choice of Species

23.21 (47.6). PUTILOV, A. N. **On the cultivation of fast-growing, valuable tree species in the south of the U.S.S.R.** *Priroda Akad. Nauk. S.S.S.R.* 1939 (4), (37-9). [R.] C.G.B.

Afforestation with exotics shows great promise in the Crimea, the Transcaucasus, and the valleys of the Central-Asiatic Republics. In Abkhazia, *Sequoia sempervirens* at 45 years reaches a height of 30 m. and a diameter of 88 cm., bears ample seed, and can also be reproduced from shoots. It has been suggested that the species could usefully be introduced into shelterbelts on soils of sufficient moisture. *S. gigantea*, which grows and reproduces successfully in the Crimea, has been recommended for afforestation in the Central-Asiatic Republics. *Cedrus atlantica* and *C. deodara* grow and regenerate satisfactorily in southern Crimea and the Transcaucasus. Thirty-year-old trees of *C. atlantica* reach a height of 20 m. and a diameter of 50 cm., and this species is considered suitable for plantations on the south-east of Crimea in mixture with Pine and other species. *C. deodara* does best in western Transcaucasus where 30- to 35-year-old trees average 17 m. in height and 37 cm. in diameter. *Cupressus sempervirens* has become by now a typical feature of the Transcaucasian and Crimean landscapes. In Abkhazia the usual size of 30-year-old trees is 30 m. height and 45 cm. diameter. Other exotics that have been successfully acclimatized in that Republic include *C. lusitanica* and *C. lawsoniana*, while *C. torulosa* grows and reproduces in many localities on the Black Sea coast. Finally, *C. nootkatensis* can be grown in southern Russia in regions with a continental climate.

23.21 (66.9). ROSEVEAR, D. R. **Exotic trees in the Cameroons.** *Niger. For.* 1, 1940 (22-5).

Successfully acclimatized exotics include species of *Cinchona*, *Hydnocarpus*, *Eucalyptus*, and *Podocarpus*, and *Cupressus macrocarpa*, *Acacia mollissima*, *Juniperus procera*, and Teak. *Eucalyptus robusta* has been grown successfully in taungya.

23.21 : 23.24 (91). STRUGNELL, E. J. **Planting primary hardwoods.** *Malay. Forester* 9, 1940 (115-8).

Hardwoods, though they may be gregarious over small areas, never cover the whole of a compartment. Experimental planting of the

intervening areas not bearing hardwoods is recommended: (a) where the prescribed yield cannot be obtained without planting; (b) where the value of the land, present or potential, is such that it cannot be left unused; (c) where no softwoods [soft hardwoods] are present on the intervening areas, or, if present, are not an economic crop. Chengal (*Balanocarpus heimii*) and Merbau (*Azelia palembanica*) are recommended as suitable species. *Author's summary.*

23.21 : 23.3 (75.6). MINCKLER, L. S. **Early planting experiments in the Spruce-Fir type of the southern Appalachians.** *J. For.* 38, 1940 (651-4). [Appalachian Forest Exp. Sta.]

Of 20 coniferous species, Southern Balsam Fir (*Abies fraseri*), Red Spruce, Red Pine, and Norway Spruce appear best suited for use in reforestation in the Southern Appalachian Spruce/Fir type. The first two of these species are indigenous to the type and Red Pine is in general indigenous to regions having a similar climate. Of the remaining 17 species, all exotics, only Norway Spruce found a favourable environment in the type. It was superior in survival and growth to Red Spruce and Red Pine on east but not on south slopes. All species were more successful on an east than on a south slope, but Red Pine showed less difference in this respect than the other three leading species.

Southern Balsam Fir showed the best survival and growth of all species, but its wide use in large-scale reforestation programmes for timber production is questionable because of its comparatively poor quality as lumber and limited market outlets. However it has a place in plantations that are primarily for recreational and watershed protection purposes. *From author's summary.*

23.22. Tools for [and Methods of] Cultural Work

23.22 : 23.24.2-3 : 11.44 : 12.2. SCHREINER, E. J. **Inhibiting effect of sod on the growth of hybrid Poplar.** *Occ. Pap. Ntheast. For. Exp. Sta.* No. 8, 1940. pp. 11+2.

Dormant cuttings of hybrid Poplar were planted in sod, circular scalps [areas from which the sod has been removed] 6, 12 and 24 in. in diameter, and ploughed ground. Survival for all methods of site preparation was satisfactory, but the average height growth on sod was 10 in.

as compared to 45 in. on ploughed ground. The poor growth vigour on sod and on the smaller scalps indicates that hybrid Poplar can not be successfully established on grass land without adequate site preparation. *From author's summary.*

23.23. Sowings

23.23 (75). McQUILKIN, W. E. **Note on direct seeding in the southeastern Piedmont region.** *J. For.* 38, 1940 (734-5). [Appalachian Forest Exp. Sta.]

First-year results indicate that direct sowing may be possible in the Piedmont region without the need of special protective measures against birds and rodents. [Cf. *For. Abs.* 2 (38).]

23.23 : 11.3 : 11.6 : 12.2 (77.5). STOECKELER, J. H., and SUMP, A. W. **Successful direct seeding of northern conifers on shallow-water-table areas.** *J. For.* 38, 1940 (572-7). [U.S. Forest Service.]

Successful direct sowing of Jack Pine under field conditions was accomplished in a severe drought year in open sand plains where there was a permanent water table at a depth of 1.5 to 5 ft. below the surface, due primarily to the capillary rise of moisture from the water table to the soil within the root zone of the trees. Average stocking ranged from 800 to 8,200 seedlings per acre and averaged about 4,500 per acre at the end of the second season after seeding. A partial stand ranging from 300 to 800 trees per acre was attained on areas with water tables deeper than 5.5 ft. The tree per cent. for the two sites, based on ratio of seedling stand at end of second year to number of viable seed sown was 7.7 and 0.9 per cent. for the shallow and deeper water tables respectively.

Spring sowing of Jack Pine proved more successful than fall sowing. Fairly good results were obtained in the direct sowing of other species, such as Red and White Pine, White and Black Spruce, and European Larch. Mixtures of Red and Jack Pine proved successful, as did mixtures of Black Spruce and European Larch. *From authors' summary.*

23.23 : 23.21 : 24.3 : 12.2 (77.8). ATTRIDGE, J. M., and LIMING, F. G. **Establishment of Shortleaf Pine in the Missouri Ozarks following seed bed preparation and release.** *Tech. Note Cent. St. For. Exp. Sta.* No. 10, 1940. pp. 4.

Litter removal and soil cultivation was the only seedbed treatment that resulted in significantly better germination and survival of 1-year seedlings. While the removal of 75 per cent. of Oak/Pine overstorey made no significant difference in the number of 1-year seedlings that survived, it did result in a 100 per cent. increase in height growth and increased plant vigour.

23.23.1. *Seed Procurement, Treatment, and Testing*

23.23.1. ROHMEDER, E. Das 'Selenverfahren' als Hilfsmittel der forstlichen Saatgutbeurteilung. [The selenium method as an aid to forest seed testing.] *Dtsch. Forstw.* 22, 1940 (33-5). [G.] *Biol. Abs.* 14 (12575).

23.23.1 : 12.11 : 12.2. ZACHARIEW, B. J. Beitrag zur Kenntnis des Samenertragnisses der Fichte—*Picea excelsa* Link. [A contribution to our knowledge of the seed yield of Norway Spruce, *Picea excelsa* Link.] *Bull. Soc. bot. Bulg.* 8, 1939 (188-95). [G.] L.S.

Investigations on material from the Tscham-Koria State Forest revealed the existence of a linear correlation between the weight of full, air-dry cones and the total weight of the seed yielded by each.

23.23.1 : 12.19.2. OOSTING, H. J., and HUMPHREYS, M. E. Buried viable seeds in a successional series of old field and forest soils. *Bull. Torrey bot. Cl.* 67, 1940 (253-73). [Duke University, Durham, N.C.] O.B.D.

Soil samples were taken from a series of abandoned fields of known age and vegetative composition: a field under cultivation; fields fallow for 1, 2, and 5 years; Shortleaf Pine stands of 15-112 years of age; and an Oak/Hickory forest. Exposed to greenhouse conditions for 37 weeks the samples produced seedlings representing 127 species of which 16 were woody. The highest total germinations were produced by soil from the field that had been abandoned but one year; the 5-year field produced the greatest number of species. Statistical analyses were made to ascertain which species were significant throughout the series and in comparisons between the various age and cover types. The distribution of significant species serves to emphasize the distinctness of the *Andropogon* fields; a difference between field and forest and between Pine and hardwood; and that forest seeds apparently require forest conditions to retain

their viability. The germinations demonstrate the presence of viable seeds in the soils of all age classes sampled, but age and origin of the seeds remain problematical. They show a succession of species, as do the plants above ground, and, in general, are indicative of that same succession. *From authors' summary.*

23.23.1 : 12.2. HARDING, J. H. *Acacia germination trials.* *Aust. For.* 5, 1940 (53-6).

Placing the seeds in boiling water for a period not longer than 5 seconds was found to be the most satisfactory treatment for accelerating the germination of seeds of *Acacia pycnantha* and *A. acuminata*. After drying the seed may be stored until required for sowing.

23.23.1 : 12.2. WAKELEY, P. C. *Storing Southern Pine seed on a commercial scale.* *Sth. Lumberm.* 159 (2009), 1939 (114). [Southern Forest Exp. Sta.]

It is recommended that Southern Pine seed should be stored at about 38° F. and that its moisture content during storage should be kept below 10 per cent. (preferably 6-8 per cent.), which requires an atmospheric humidity in the storage plant of less than 40 per cent. To assist in breaking dormancy in seed removed from storage, stratification at 35-38° F. for not more than 30-40 days is tentatively recommended as suitable for commercial work.

23.23.1 : 23.26.5 : 12.2. GRUENHAGEN, R. H. *Growth substances of doubtful benefit for treatment of Pine seeds.* *J. For.* 38, 1940 (739-40). [University of Wisconsin.]

The plant 'hormones' used were naphthalene-propionic acid in a 1-1,000 dispersion in talc and indol-3-acetic acid in dilutions of 1 in 500 to 1 in 20,000. Results of the tests indicate that these 'hormones' do not act as seed surface disinfectants or protect Red and White Pine seed from damping off, nor do they increase the percentage of germination.

23.23.3. *Methods of Sowing*

23.23.3 : 07.7. PETHERAM, H. D. *The potato planter adapted for seed-spotting forest trees.* *Soil Conserv.* 6, 1940 (76-7). [Soil Conservation Service.]

For use in seed-spotting Walnut, Hickory and similar large-seeded species. The main advantage in using this tool is uniform depth in planting, a 2- to 3-inch covering of soil being most successful for these species. Also cost of planting is reduced.

23.23.3 : 12.2 (945). POWLES, R. **Artificial regeneration of Mountain Ash (*Eucalyptus regnans*)**. *Aust. For.* 5, 1940 (26-32).

Areas on which Mountain Ash has been destroyed by severe or successive fires may revert to scrub or bracken-covered waste. Preliminary results from investigations into the artificial regeneration of such areas indicate that : (1) Late in March or the first of April is the best time for sowing; early sowing is more important on southern than on northern slopes as there is a high incidence of early mortality due to frost-lift following late sowing on the former. (2) Broadcast sowing with 1 lb. of seed per acre should result in the establishment of sufficient regeneration. (3) Controlled burning to prepare the site should be done at the end of March if possible, to be followed immediately by sowing.

23.23.3 : 45.1. MILLER, C. I. **An economical seed spot protector**. *J. For.* 38, 1940 (733-4). [University of Idaho.]

No. 3 mesh hardware cloth is cut into parallelogram-shaped sections having an 8-in. base, a 7.2-in. perpendicular height and interior angles of 60° and 120°. The top left-hand corner is notched and the material is folded in the shape of a cone and placed over the seed spot, the base being forced 2 in. into the ground. Eighty per cent. of the full sunlight reached the seedlings through this material.

23.24. Formation of Crops (Stands) by Planting

23.24 : 2 (71.3). RICHARDSON, A. H. **Forest tree planting**. *Bull. For. Br. Ont.* No. 1, [reprinted] 1939. pp. 80.

A bulletin intended for the use and guidance of farmers and private landowners who desire to take up this work on a small scale.

23.24 : 21.6 : 11. ROWE, W. H. **The causes of failures in young plantations**. *Quart. J. For.* 34, 1940 (162-6).

A brief indication of the variety of factors that may contribute to the death of young trees after planting out.

23.24.1. Planting Material. Age and Size of Plants

23.24.1 : 12.2. ESTILLORE, F. E. **Preliminary study on the storage test of bare-rooted Amugis seedlings**. *Philipp. J. For.* 3 (1), 1940 (135-41). [Bureau of Forestry, Philippines.]

Of the packing materials tested for use in seedling storage, leaf mould lost the smallest amount of moisture and gave the highest percentage of seedling survival after seven and fourteen days; sawdust gave the second best results and rice hull was third.

23.24.4. Time of Planting

23.24.4 : 12.2 (54.8). LAURIE, M. V. **Pre-monsoon stump planting of Teak in Upper Godaveri Division, Madras**. *Indian For.* 66, 1940 (465-7).

Premonsoon planting experiments with Teak root and shoot cuttings in Upper Godaveri Division, a dry locality with few premonsoon showers, show that best results are obtained by planting about three weeks before the break of the monsoon. This gives high survival per cent. combined with a 100 per cent. increase in first-season height growth as compared with planting at the break of the monsoon. *Author's summary.*

23.26. Plant Rearing. Nursery Practice

23.26.1. Description of Different Nursery Methods

23.26.1 : 23.23. READ, A. D. **A nursery problem**. *J. For.* 38, 1940 (740-1). [Kisatchie National Forest.]

A formula for use in determining the amount of seed that should be sown to produce a given number of seedlings (Toumey, J. W., and Korstian, C. F., 'Seeding and planting in the practice of forestry', 1931) is re-written as

$$\text{Pounds of seed required} = \frac{\text{No. of seedlings desired on area}}{\text{No. of seed per pound} \times \text{purity percentage} \times \text{tree percentage}}$$

The three factors other than tree percentage can be determined prior to sowing. Tree percentage can be known definitely only when the trees are lifted, and is affected by a number of variables, only one of which can be determined prior to sowing. This variable in germinative energy, which can be used by the nursery man as the basis for his estimate of tree percentage, giving careful consideration to the possible values of the other factors. From records over a period of years it may be possible to build up a tree-percentage table for any species based on germinative energy alone.

23.26.1 : 23.24.1 : 12.2. SMITH, L. F. **Influence of root-pruning after digging on the growth of certain hardwoods.** *J. For.* 38, 1940 (600-1). [Kansas Agricultural Exp. Sta.]

Experimental results indicate that Hardy Catalpa, Green Ash, and Black Locust may be root-pruned to about 4 in. without significantly reducing field growth the first season, while severe root-pruning of American Elm and Hackberry (*Celtis occidentalis*) may be followed by reduced growth.

23.26.2. *Rearing of Individual Species*

23.26.2 : 12.2. HUBERMAN, M. A. **Normal growth and development of southern Pine seedlings in the nursery.** *Ecology* 21, 1940 (323-34). [U.S. Forest Service.]

A study of the normal growth and development of southern Pine (*Pinus palustris*, *P. caribaea*, *P. taeda* and *P. echinata*) seedlings was carried on for three years at a nursery in central Louisiana and the following conclusions were reached:

Germination.—Low germination appears to be related to the condition of the seed when it comes out of storage, rather than to nursery-bed conditions. Germination takes place about 12-20 days after sowing and can be facilitated by watering to prevent drying-out of the emerging radicles. Lifting of burlap or other cover must not be delayed too long, and must be done with care.

Growth.—Root elongation takes place more rapidly than top development early in the season. There is a tendency, but with much variation, towards alternation between root activity and top activity. The increase in weight in both tops and roots late in the season is not accounted for by increasing numbers of needles and roots, but points toward deposition of reserve foods. Root growth continues after the first frost, and through the winter. Top growth varies less from season to season than does root growth, traceable in part to soil variability.

Site factors.—Despite high surface-soil temperatures southern Pine seedlings are resistant to heat injury, indicating no need for artificial shading under ordinary circumstances. Soil moisture should be held around 10 per cent. and should not be permitted to drop below the wilting point; liberal use of the watering system is indicated. *From author's summary.*

23.26.2 : 12.2. RAVITZKY, B. **The raising of *Pinus halepensis* seedlings in Nazareth Forest Nursery.** [Jerusalem? 1940?]. pp. 2.

Cones are collected during August-September, a 4-gal. tin of cones giving nearly $\frac{1}{2}$ kg. of clean seeds. The best time for sowing is October-middle of November. Petrol tins cut in halves are used for seedbeds and the soil used is a $\frac{2}{3}$ heavy loam- $\frac{1}{3}$ sand mixture. The seeds are broadcast-sown, covered lightly with soil and also frequently with moist burlap. Soil is kept moist and germination after 15-20 days is usually 80-90 per cent. Burlap is removed as germination begins. Watering with 0.1 per cent. 'Ceresan' (poisonous fungicide) has been successful in checking damping-off. Seedlings are transplanted to tins between the last of February and the beginning of April. Watering decreases from daily at first to every 15-20 days at the end of the growing season when plants vary from 15-30 cms. Cost of seedling production is analysed.

23.26.3. *Transplanting*

23.26.3. THOMPSON, A. R. **Transplanting trees and other woody plants.** *Tree Pres. Bull. U.S. nat. Park Serv.* No. 9 (*Conserv. Bull.* No. 5), 1940. pp. 59.

23.26.5. *Treatment with Growth Substances*

23.26.5 : 21.5 : 12.11. SWINGLE, C. F. **Regeneration and vegetative propagation.** *Bot. Rev.* 6, 1940 (301-55). [Soil Conservation Service, U.S.D.A.]

A review of recent research dealing with vegetative propagation and closely related problems including the use of growth substances.

23.26.5 : 21.5 : 24.5 : 12.11. OLIVER, R. W., and GRACE, N. H. **Some uses of plant hormones.** *Circ. Dep. Agric. Can.* No. 148 (*Publ.* 665), 1940. pp. 12. [National Research Council, Ottawa.]

A popular account intended for horticulturists.

23.26.5 : 21.5 : 12.2. GRACE, N. H. **Effects of dusts containing indolyl-butyric acid and oestrone on the rooting of dormant *Lonicera tatarica* cuttings.** *Canad. J. Res.* 18, Sec. C., 1940 (283-8). [National Research Laboratories, Ottawa.] P.R.

Indolyl-butyric acid and oestrone, separately and in combination in a series of talc dusts,

were applied to dormant cuttings of *Lonicera tatarica*. Indolyl-butyric acid treatment, averaged over all oestrone treatments, increased the number of cuttings rooted, the number and length of roots per rooted cutting, the mean root length, and the green weight of leaf produced by the dormant cuttings. The average effect of oestrone on these responses was depressive throughout. Oestrone tended to offset the beneficial effects of the plant growth stimulating chemical, excepting the combination of 100 p.p.m. of each which increased root length. Oestrone alone did not reduce either the number or lengths of root per rooted cutting. The results indicated that the number and length of roots and the green weight of leaf produced are more sensitive responses for demonstrating differences due to indolyl-butyric acid concentration in talc than is the percentage of cuttings rooted. *Author's summary.*

23.26.5 : 21.5 : 12.2. GRACE, N. H., and FARRAR, J. L. **Vegetative propagation of conifers. VI. Hormone solution and dust treatments of Spruce cuttings propagated in greenhouse and outside frames.** *Canad. J. Res.* 18, Sec. C., 1940 (401-14). [National Research Laboratories, Ottawa.] P.R.

Four monthly collections of dormant Norway Spruce cuttings, January to April, were treated with indolyl-butyric acid solutions and propagated in sand in a greenhouse. February and April collections gave better rooting than those of the other two months, while there was appreciably greater mortality of the March and April collections. The results with short cuttings were uniformly superior to those obtained with long cuttings. Other cuttings of the April collection were propagated outside. The short cuttings responded more favourably to outside conditions, while the long cuttings gave equally poor results inside and outside. Indolyl-butyric acid treatment had no beneficial effect and was followed by reduced rooting and increased mortality at concentrations from 20-60 p.p.m.

Results of a late March collection of Norway, White, and Black Spruce cuttings treated with talc dusts containing indolyl-acetic acid, cane sugar, and organic mercury, indicated that Norway Spruce rooted more readily than the two other species. Treatment failed to have a beneficial effect, although injury from indolyl-

acetic acid was somewhat reduced by its combination with organic mercury.

The results of these and the other experiments reported indicate that short Norway Spruce cuttings over the period from January to April root to the extent of about 50 per cent. A May collection, an early June collection with new growth on the cuttings, and a late June collection in which the cuttings were made from new growth only, gave inappreciable rooting. Similar new-growth cuttings did, however, give some rooting when propagated in sand watered with nutrient salts. *Authors' summary.*

23.26.5 : 21.5 : 12.2. STOUTEMYER, V. T., JESTER, J. R., and O'ROURKE, F. L. **Propagation of Black Locust clones by treating hardwood cuttings with growth substances.** *J. For.* 38, 1940 (558-63). [Bureau of Plant Industry, U.S.D.A.]

Results from experiments in the propagation of Common Black Locust and its varieties from hardwood cuttings show that: (1) Cuttings should be more than 12 mm. in diameter and should not consist of shoot tips or of 4- or 5-year-old wood with deeply fissured bark. (2) Cuttings should be calloused before treatment with growth substances so as to prevent injury from concentrations high enough to induce abundant rooting. Callousing may be obtained in 10 days by packing cuttings in moist sphagnum in a container heated at 68° to 80° F. (3) An aqueous solution of 100 mg. per l. of indole-acetic acid applied to the basal ends of calloused cuttings for 24 hours gave the best results, while naphthalene-acetic acid applied at the same concentration and for the same period produced heavy rooting but was slower in action. (4) A period of storage of the cuttings at a temperature of 70° F. following the treatment with growth substance allows the root primordia to form under favourable conditions.

Survival of cuttings in successful field plantings reached 69 per cent. and excellent plants were produced. Over 90 per cent. rooting was often obtained under greenhouse conditions.

23.26.7. *Damage in Nurseries and Methods of Protection*

23.26.7 : 12.12 : 12.2 : 13.2 (76.8). WILFORD, B. H. **The seed-corn maggot, a pest of Red Cedar seedlings.** *J. For.* 38, 1940 (658-9).

[Bureau of Entomology & Plant Quarantine, U.S.D.A.]

The maggots (*Hylemya cilicrura*) attack young Red Cedar (*Juniperus virginiana*) seedlings through the roots or the soft bark of the stem, eating the soft tissue beneath the bark. The first indication of attack is an unhealthy appearance of the seedlings followed by wilting and yellowing of the stems at and above ground line, and finally the shredded bark and injured roots indicate the damage done. If only lateral roots are attacked and conditions are favourable, adventitious roots may develop and the plant recover. It is suggested that infestations may be prevented by using inorganic rather than organic fertilizers, applying them in the fall or after the seedlings are 1½ to 2 in. above ground, and by delaying planting so that seedlings do not develop during the wet period. Satisfactory control may be obtained by spraying carbon disulphide emulsion (1 quart of 50 per cent. strength to 50 gallons of water) at the rate of 1 pint per sq. ft. of soil surface.

23.27. Arboriculture

23.27. MULFORD, F. L. **Care of ornamental trees and shrubs.** *Fmrs. Bull. U.S. Dep. Agric.* No. 1826, 1939. pp. 79.

23.27 (71.3). RICHARDSON, A. H. **Trees for schools.** *Circ. For. Br. Ont.* No. 15, [revised ed.] 1940. pp. 22.

23.27 : 12.2. BEILMANN, A. P. **The Bald Cypress as a shade tree.** *Bull. Mo. bot. Gard.* 28, 1940 (111-4). *Pl. Sci. Lit.* 11 (26), (12).

23.27 : 24.5. RICHARDSON, A. H. **The care of trees.** *Bull. For. Br. Ont.* No. 4, 1940. pp. 40.
With reference to ornamental trees.

23.3. Afforestation

23.3 : 11.6 (54.5). CHOPRA, R. S. **Experimental afforestation of water-logged areas in the Punjab.** *Indian For.* 66, 1940 (545-51).

An experimental plantation was formed in the Shahpur District of the Punjab with a view to improving waterlogged land along an irrigation canal. Trials with several Eucalypts began in 1932 and *Eucalyptus rostrata* was selected as the most promising species. Nursery and planting operations are described. Expenditure from 1932-39 was Rs.2,206 for plant-

ing and Rs.512 for fencing, and revenue from grazing and grass cutting was Rs.1,692. Taking the latter into account, the net cost of establishment was Rs.13 per acre. At 7 years of age the trees average 37 ft. in height and 3-8 in. d.b.h., which is rather low for the species, but the water table has retreated to about 4 ft. below the ground and the Eucalypts seem to have paved the way for the introduction of other species. It is suggested that further plantations should be established along the main canals with the dual object of reducing water-logging and providing a much-needed local timber and fuel supply.

23.5. Underplanting. Nurse Trees

23.5 : 56 : 12.2. KOBRANOV, N. P. **The influence of *Caragana* as an underwood on the increment of *Quercus pedunculata* Ehrh. in plantations of the Veliko-Anadole district.** *Trud. lesotekh. Akad. Kirov.* No. 52, 1938 (34-52). [*R.*] *For Curr. Lit.* 6 (282).

23.7. Slash Disposal. Clearing of Site

23.7 : 32.2 : 32.5 (71.1). McWILLIAMS, H. G. **Cost of snag falling on reforested areas.** *Res. Note. B.C. For. Serv.* No. 7, 1940. pp. 3.

Snag falling is a necessary fire-preventive measure on all reforestation areas. It is concluded that to be satisfactory this operation should be under a foreman and that a scale be kept of the daily individual cut, payment to be made on a contract basis at so much per unit of wood cut.

24. TENDING OF STANDS AND TREES

24.1. Cleanings

24.1 : 23.13 : 12.2 (91). DURANT, C. L. **Meranti tembaga and secondary growth.** *Malay. Forester* 9, 1940 (103-10).

The results of the detailed examination of three treatment plots containing regeneration of *Shorea leprosula* are described, and it is shown that this species can survive competition from secondary growth more successfully than was hitherto thought possible. The bearing of this characteristic on the regeneration methods at present employed for this species is also discussed. *Author's summary.*

24.1 : 44.1 : 12.2 (71.3-6). SCHIERBECK, O., and CLARKE, W. B. M. **Sprout control in Wire [Grey] Birch stands.** *Silv. Res. Note Dom. For. Serv.* No. 63, 1940. pp. 11. [Acadia Forest Exp. Sta.]

Betula populifolia is a typical weed tree of many burned-over areas in Eastern Canada. Of the several methods of elimination tested, girdling at 3 ft. height in January produced the smallest total sprout growth 4-5 years after treatment.

24.2. Thinnings

24.2-3 : 12.2 (485). TILLANDER, T. Stava-granen och dess vård. [Stagnated Spruce woods and their improvement.] *Skogs-ägaren* 16, 1940 (111-3). [Sw.]

Stagnated Spruce woods are found in Norrland chiefly on heavy moraine soils that are liable to slight surface waterlogging. When such soils are bared, e.g. by fire, the conditions become very favourable to Spruce regeneration, and if natural seeding is heavy a dense stand of seedlings springs up. Owing to the compactness of the soil the roots grow mostly in the topmost soil layers, and root competition becomes so intense that the growth of the whole stand is gradually checked and all capacity for self-thinning is lost. The result is that even at an advanced age there may be more than 10,000 stems per ha., the thickest not more than 3-4 in. in diameter. Investigations by E. Ronge indicate that competition for soil and light are not the only adverse factors, and suggest that soil temperature may also be of great importance. The dense canopy intercepts a great deal of the winter snowfall, thus depriving the soil of its protection and increasing the depth of frost penetration. The frozen soil may thaw as much as 2-3 weeks later than in more open stands. Though such woods make up only a small proportion of the forest area of Norrland, they are frequent where they do occur, and constitute a serious silvicultural problem. The sole remedy is to thin heavily, comparatively little tree selection being necessary as the trees are more or less even in development. As a result of the enormous number of stems it is often necessary to remove 70-80 per cent. by number, but though the poorly developed crowns at first give thinned stands a very open appearance, the residual trees quickly respond to the improved conditions. The response is often too great to attribute merely to release, and is probably

accounted for by a longer vegetation period brought about by an improved soil climate. The wood removed is almost or quite worthless in normal times, but State grants are made for the thinning of such woods and 25,000 ha. have been thinned in the period 1930-8.

24.2-3 : 12.2. WAHLENBERG, W. G. **Rules of thumb for spacing of timber trees.** *Sth. For. Notes* No. 34, 1940 (1-2).

A simple rule for desirable spacing may be worked out on the relation between spacing in feet and stem diameter in inches for trees of suitable form that are at present growing at satisfactory rates.

24.21 : 24.25 (71.5). CLARKE, W. B. M. **Experimental girdling in mixedwood stands in New Brunswick.** *Silvic. Res. Note Dom. For. Serv.* No. 62, 1940. pp. 24 + graphs.

The girdling of 75 per cent. of the hardwoods in mature stands of tolerant hardwoods and conifers has resulted over a period of ten years in (a) a rapid increase in diameter growth on immature conifers that were free from defect or serious suppression, (b) a considerable increase in the annual volume production of conifers, and (c) coniferous species gradually becoming more dominant on areas where the girdling was carried out. The residual hardwoods have shown no response to release. It is concluded that girdling is an economically wise treatment of this type of mixed stand.

24.21 : 44.1 : 12.2 : 97.3 (78.9 : 79.1). PARKER, K. W. **The use of arsenic in the control of Mesquite in the Southwest.** *Res. Note Sthwest. For. & Range Exp. Sta.* No. 88, 1940. pp. 5.

For controlling Velvet Mesquite (*Prosopis velutina*) a stock solution of sodium arsenite is prepared by mixing 8 lb. arsenic trioxide powder with 2 lb. caustic soda flakes and dissolving the mixture in 3 qt. water to make 1 gal. of stock. Small trees below 3 in. in diameter are best poisoned by digging a shallow basin or trench round their base and pouring in about 1 pint of a solution made by diluting the stock with 6 parts of water. Larger trees should be frill-girdled: for this purpose 1 part of stock should be diluted with 3 parts of a starch solution made by dissolving 1 cup of starch in a small amount of water, adding 1 gal. of boiling water, and cooking till clear. The solution is most readily applied by means of a quart engineers' oil-can with a pump

attachment. Both methods of poisoning should be applied only between late autumn and early spring. Costs, precautions, and equipment are discussed.

24.25 : 56 : 23.1 : 11.1 : 12.2 (74.2). JENSEN, V. S. **Results of thinning and its effect on residual Yellow Birch and associated hardwood species.** *Tech. Note Ntheast. For. Exp. Sta.* No. 33, 1940. pp. 4.

The removal of nearly one-half the volume from an even-aged, 60-year-old hardwood stand had a marked effect on weather conditions within the stand, particularly during the first year following cutting. Maximum temperatures were raised and minimum temperatures lowered, relative humidity was decreased and wind movement greatly increased with a considerable increase in evaporation. At the end of the second growing season following treatment Yellow Birch showed signs of decadence (the presence of die-back, epicormic branches, and *Armillaria mellea*), while other species appeared thrifty. At the end of five years the thinned plot had closed somewhat and basal area increment was found to have been greater than on the check plot, particularly for the smaller trees. On the thinned plot the establishment of new trees in the stand more than offset losses by death while the reverse was true for the check plot. Opening of the stand also favoured the growth of advance reproduction, sprouts and root suckers, and the establishment of seedlings.

24.3. Opening of the Canopy.

Release and Improvement Cuttings

24.36 : 22.15 : 56 : 23.1 : 12.2 (76.3). CHAPMAN, H. H., and BULCHIS, R. **Increased growth of Longleaf Pine seed trees at Urania, La., after release cutting.** *J. For.* 38, 1940 (722-6). [Yale University.]

In even-aged groups of veteran Longleaf Pine (*Pinus palustris*) the retarded growth of individuals is due largely to root competition, and when the competing trees are removed the suppressed individuals respond immediately with an increased growth rate. Thus both roots and crown are capable of increased efficiency even before they expand beyond their pre-release condition. The distance that roots are able to spread from the bole, which in the example cited was 30 ft., is believed to be the factor that finally limits increase in growth rate. Within this area of root penetration, seedlings

have great difficulty in becoming established and the released veteran attains a uniform growth rate that is not affected by competing reproduction and, in the case cited, has continued for a recorded period of 36 years without any sign of decrease.

It has been determined that crown length is a reliable indicator of potential volume growth of a tree after release and that a 40-ft. crown gives the qualities most desirable in a reserve tree.

The authors propose a system of management for this species, based on their experience. The final cutting of the mature stand should be heavy but should leave 4 to 6 well-formed, pruned seed trees per acre, isolated if possible, with 40-ft. crowns and 8-11 in. d.b.h. These trees will form a valuable saw-log cut at the end of 40 years when the reproduction that has become established will be old enough to seed in the blanks caused by the removal of the seed trees. The stands of two age classes thus produced would be cut on a 80-year rotation for saw logs with intermediate operations for secondary products. It is pointed out that an all-age selection forest is not favourable to the regeneration of this species.

24.4. Shelterbelts. Windbreaks

24.4 : 23.5 : 24.1 (47.6). LOGGINOV, B. I. **The improvement of unsatisfactory forest plantations.** *Lesnoe Khozyaystvo, Moscow* 1940 (6), (29-32). [R.]

In the beating-up of 1- to 7-year-old shelterbelt plantations in the Ukraine, survival and growth of the new seedlings were improved, and the formation of a canopy accelerated, by cutting back the old stock, which quickly recovered by coppicing.

24.4 : 23.3 : 23.21 (71.11 : 71.21). ROSS, N. M. **Tree-planting on the prairies of Manitoba, Saskatchewan and Alberta.** *Fmrs'. Bull. Dep. Agric. Can.* No. 64 (Publ. 623), 1939. pp. 62. [Forest Nursery Station, Indian Head, Saskatchewan.]

A practical guide to shelterbelt and hedge planting.

24.5. Pruning

24.5 : 07.7. KACHIN, T. **The Hebo pruning club.** *J. For.* 38, 1940 (596-7). [Pacific Northwest Forest Exp. Sta.]

A tool that has been found satisfactory for pruning Douglas Fir, particularly for dead limbs that are relatively sound or live limbs that

are large and brittle, consists of a tool handle from 17 to 33 in. long, depending on how it is to be used, shod on the end with a piece of $\frac{1}{8}$ in.-thick steel. Branches are removed by a blow at or near the branch collar and are generally broken off well within the collar. This tool is faster than a pruning saw and removes branches as large as 2 in. in diameter.

24.5 : 56 : 12.2. McLINTOCK, T. F. **Growth response of planted Pitch Pine to differential pruning.** *Tech. Note Cent. St. For. Exp. Sta.* No. 15, 1940, pp. 2.

3. FOREST UTILIZATION.

3 : 07 (71). KYNOCH, W. **A long-time plan for increasing the value of wood as an industrial material.** *For. Chron.* 16, 1940 (216-9).

It is pointed out that most outstanding developments in the field of wood utilization in recent years have come from Europe and a number of reasons are suggested for the lack of progress in North America. Measures that should be taken to remedy this condition are increased efforts in timber research, which would probably be too costly to undertake during the war period, and the employment of properly trained technical men in the wood industries.

3 : 12.2 (410). DAVEY, R. **Using home-grown hardwoods.** *J. Land Agents' Soc.* 39, 1940 (348-9).

A number of commercial uses for British-grown hardwoods are listed together with suitable species.

3 : 12.2 (68). SCOTT, M. H. **The utilisation of South African grown *Eucalyptus saligna*.** *J. S. Afr. For. Ass.* No. 4, 1940 (46-54). [Forest Products Institute, S. A. Division of Forestry.]

E. saligna and the closely allied *E. grandis* are grouped together as *Saligna* Gum. The characteristics, properties, uses and future prospects of the wood are discussed briefly.

Log splitting, an inherent defect of these species, may be reduced by rapid conversion after felling, by dealing with long log lengths, and by using a frame saw in breaking down the logs. Boards should be seasoned before edging or cutting to width. Proper seasoning

Preliminary results obtained one year after the pruning of Pitch Pine (*Pinus rigida*) in a 4-year-old plantation showed that (a) height growth was not significantly affected by any of the three degrees of pruning tested, (b) diameter growth was not materially affected by light pruning (up to 1.5 ft.) or moderate pruning (just less than half the crown removed) while heavy pruning (two-thirds to three-quarters of the crown removed) caused a heavy loss in diameter increment and more so at the lower (1.5-ft.) than at the upper (4.5-ft.) diameter measured.

FOREST TECHNOLOGY

causes practically no defect and air seasoning should be followed by kiln drying to obtain high-grade material. A suitable schedule for $\frac{1}{8}$ in. stock would be 4-6 weeks' air drying followed by 5-7 days in the kiln.

The weight of the wood varies with its position in the tree, the outer wood being heavier, and it also varies from tree to tree of the same age, size and locality by as much as 14 or 16 lb. per cu. ft. Strength also varies, the inner wood being brash while outer wood is strong for its weight. The wood is not durable but will respond to preservative treatment and treated posts may last twenty years or more if the heartwood is not exposed longitudinally. Owing to its lightness and good form the chief market for this wood is mine props. It is also used for poles, posts, laths, box shooks, and has a possible use in making short-fibred pulp, while larger material has been used in panelling, flooring and furniture manufacture.

3 : 12.2 (73). BETTS, H. S. **American woods: Northern White Pine (*Pinus strobus*).** Forest Service, U.S.D.A. Washington, D.C. 1940. pp. 9 + 2.

Data on nomenclature, distribution and growth, supply, production, properties, and principal uses, with statistics on the quantities used in the manufacture of various wooden products in the United States in 1912, 1928, and 1933.

3 : 97.4 (79.5 : 79.7). CLARK, E. T. **Utilization problems of the logging and lumber industry of the Pacific Northwest.** *J. For.* 38, 1940 (710-5). [Pacific Northwest Loggers' Association.]

31. PROPERTIES AND ANATOMY OF WOOD

31 : 12.2 (7 : 8). RECORD, S. J., and HESS, R. W. **American timbers of the family Bignoniaceae.** *Trop. Woods* No. 63, 1940 (9-38).

Descriptions of the woods, accompanied by brief notes on uses, common names, and distribution. A 'key to the generic groups' is provided.

31 : 12.2. Brazilkiefer, *Araucaria angustifolia* O. Ktze. [Parana Pine, *A. angustifolia (brasiliensis)*.] *Merkblätter über koloniale Nutzhölzer* No. 11. pp. 10. [G.] P.R.

31 : 12.2. Balsa, *Ochroma spec.* *Merkblätter über koloniale Nutzhölzer* No. 12. pp. 14. [G.] P.R.

31 : 12.2. Tanda, *Rhizophora mangle* L. [Red Mangrove, *R. mangle*.] *Merkblätter über koloniale Nutzhölzer* No. 10. pp. 9. [G.] P.R.

31 : 33 : 12.2 (73). MARX, D. S. **The American book of the woods. Prints and uses of 256 trees, shrubs, herbs and vines.** Botanic Publishing Co., Cincinnati. 1940. Pl. Sci. Lit. 12 (3), (17).

31 : 33 : 12.2 (91). WATSON, J. G. **Malayan woods for home supply.** *Malay. Forester* 9, 1940 (123-6).

Softwoods do not grow in Malaya, and of the relatively soft timbers only the milder Meranti grade is grown in sufficient quantity to be considered as a softwood substitute. The commonest species of this grade is *Shorea leprosula*, which compares closely with Scots Pine in regard to weight, shrinkage and general strength characters although it inclines to be more brittle. *Dipterocarpus baudii*, *D. cornutus* and *Dryobalanops* spp. could well be substituted for Oak.

31 : 33 : 12.2 (94). **The properties of Australian timbers: Red Cedar (*Cedrela toona* Roxb. var. *australis* C. DC.).** *Mon. News Lett. Div. For. Prod. Aust.* No. 104, 1940 (4).

31 : 33 : 12.2 (94). **The properties of Australian timbers: Grey Box (*Eucalyptus hemiphloea* and *E. largeana*).** *Mon. News Lett. Div. For. Prod. Aust.* No. 103, 1940 (3).

31.1. Form. Size. Structure. Anatomy. Identification

31.1 : 12.14 : 12.2 YATSENKO-KHMELEVSKI, A. A. **Wood structure as a systematic character.** *Priroda Akad. Nauk S.S.S.R.* 1939 (10), (42-4). [R.] C.G.B.

A brief review of English and American literature.

31.1 : 12.14 : 33.31 : 33.36 : 12.2. **Report of Subcommittee on the investigation of benzidine stain as a heartwood-sapwood indicator in the various Pine woods.** *Proc. Amer. Wood Pres. Ass.* 36, 1940 (158-64).

A benzidine stain has been extensively tested by a number of observers and has proved more satisfactory than nigrosine as a heartwood/sapwood indicator for Pine woods, though it is not recommended for use with other conifers or with hardwoods. Its chief advantages over nigrosine are that: (i) it gives a sharp colour contrast between the two types of wood and demands much less experience on the part of the observer; (ii) it appears to be unaffected by moisture content or the presence of sap stain; and (iii) it gives good results with species such as Red and Lodgepole Pine, for which nigrosine seems to be unsuitable. The preparation and use of the stain are described in a standard specification.

31.1 : 31.2 : 12.2 : 11.6 : 11.41 (75-6). PILLOW, M. Y. **Characteristics of Ash from southern bottomlands.** *Sth. Lumberm.* 159 (2009), 1939 (131-6). [Forest Products Laboratory, Madison, Wis.]

The wood structure, density, and mechanical properties of Green Ash (*Fraxinus pennsylvanica* var. *lanceolata*) from bottomlands in the southern United States were investigated, with particular reference to the effects of depth of flooding and impeded soil drainage. Trees of this species develop swollen butts to an extent that varies directly with these site factors. Of the properties studied, density varied least and stiffness and shock resistance most. Wood from the swollen butts was lighter, softer, and inferior in strength to that from the remainder of the trunk. All properties of wood from the swollen butts of deeply flooded trees were inferior to those of wood from the same log-length of shallowly flooded trees. The wood of deeply flooded trees was inferior throughout the trunk to that of shallowly flooded ones, and wood from shallowly flooded trees on well

drained soil was superior in all properties except shock resistance to that grown on poorly drained soil. The effect of site upon wood structure and of wood structure upon physico-mechanical properties is discussed and illustrated, and it is urged that such factors should be considered in selecting Ash for special purposes. If wood of high strength properties is desired, it is clear that only shallowly flooded trees should be chosen and that the swollen portion of the butt log should be rejected.

31.1 : 31.27 : 12.2. VANIN, S. I. **The anatomical structure and the physico-mechanical properties of the wood of *Eucommia ulmoides* Oliv.** *Sovetsk. Bot.* 1940 (1), (51-6). [R.] L.S.

Included are test data and drawings of sections and wood elements based on specimens from 5- to 10-year-old trees. In its

mechanical properties the wood of *E. ulmoides* resembles such hard timbers as Hornbeam, Ash and Maple.

31.2. *Physical Properties*

31.2 : 12.2 (91). **Tests on small clear specimens in a green condition made at the Timber Research Laboratory, Sentul, (Test Sheet No. 29) Mersawa (*Anisoptera marginata* Korth and *Anisoptera laevis* Ridl.).** *Malay. Forester* 9, 1940 (133-8).

The woods are described and the results of the tests tabulated. *A. marginata* grows mainly in inland swamps while *A. laevis* is found on the slopes of the inland hill forest. The following table taken from the text indicates the suitability of these and other timbers for certain uses. All values are expressed as percentages of similarly calculated values for Teak.

Species	Wt. at 50 per cent. m/c in lb. per cu. ft.	Strength as a beam	Stiffness as a beam	Suitability as a post or strut	Shock- resisting ability	Shear	Hardness
Mersawa (<i>Anisoptera marginata</i>)	89	70	95	77	58	86	71
Mersawa (<i>A. laevis</i>)	88	78	99	86	69	98	73
Meranti tembaga (<i>Shorea leprosula</i>)	79	67	99	81	66	84	50
Seraya (<i>S. curtisii</i>)	88	85	111	96	85	94	70
Keruing (Average of <i>Dipterocarpus</i> <i>cornutus</i> and <i>D. baudi</i>)	109	91	137	109	86	100	79

31.21. Colour. Lustre. Odour. Texture. Figure. Conductivity

31.21-3 : 33.35 : 33.36. MACLEAN, J. D. **Relation of wood density to rate of temperature change in wood in different heating mediums.** *Proc. Amer. Wood Pres. Ass.* 36, 1940 (220-48). [Forest Products Laboratory, Madison, Wis.]

(1) The experiments show that wood seasoned below the fibre-saturation point heats slower than green material. Differences in moisture content above the fibre-saturation point, however, do not appear to have an important effect upon the rate of temperature change. (2) No appreciable difference was noted in the rate of temperature change in the radial as compared with the tangential direction

in either seasoned or green material, but the rate of heating in the longitudinal direction was found to be between 2 and 3 times as fast as in the transverse direction. (3) The heating medium used has an important bearing on the rate of temperature change in wood. Steam was found to heat wood faster than water; water heated the wood faster than coal-tar creosote; and creosote heated faster than when hot plates were used. (4) The diffusivity varies with the specific gravity of the wood and for practical purposes the relation between diffusivity and specific gravity may be considered as linear. *From author's summary.*

31.21 : 01. MCKEAN, H. B. **The texture, grain, and figure of wood.** *J. For.* 38, 1940 (664-5). [Louisiana State University.]

While the term texture as applied to wood is now generally recognized as indicating variations 'in the size and the proportional amounts of wood elements', it is pointed out that there is an overlapping of and confusion between the terms grain and figure. It is proposed that grain should be used only with reference to the direction of the wood elements in relation to the tree axis or longitudinal edges of the timber, and that figure should refer only to the pattern-like arrangements on the longitudinal surfaces of wood.

31.21 : 31.1. WANGAARD, F. F. **Transverse heat conductivity of wood.** *Heating, Piping, & Air Conditioning*, July 1940 (459-64). Repr. [University of Washington, Seattle.]

The heat conductivity of a large number of woods was determined by a hot-plate method. A rather high correlation was found to exist between heat conductivity and density and moisture content below the fibre-saturation point. Radial conductivity was found to exceed tangential conductivity in the hardwoods by a small but significant amount, which may reasonably be attributed to the influence of the medullary rays. The ray volume in softwoods is so small that this differential influence was insignificant. The type, size, and arrangement of the longitudinal cells, at least in so far as they are contrasted in the structure of hardwoods and softwoods, had no appreciable effect upon the transverse heat conductivity. Peculiarities in gross structure or chemical composition of the wood of individual species appeared to exert little or no influence upon heat conductivity, other than that due to the resultant change in density. Within the wood of any one species the relationship between conductivity and density may deviate considerably from that determined from a study of numerous specimens from different species, presumably owing to the occurrence of a type of wood that is abnormal in the submicroscopic structure of the cell wall. *From author's summary.*

31.22. Relation to Water, Air, Gases

31.22 : 01. MITCHELL, J. **Determination of moisture in native and processed cellulose. Titrimetric determination using Karl Fischer reagent.** *Industr. Engng. Chem. (Anal. Ed.)* 12, 1940 (390-1). [E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.] P.R.

Details are given of a method for determining the moisture content of cellulose materials by cold extraction of the water with methanol, followed by direct titration of the extract with Karl Fischer reagent. The method has been applied to various types of material including both processed material for which a single extraction is sufficient, and native wood for which two extractions are required. Figures are quoted to show that the process gives a greater water recovery than the oven-drying method.

31.22 : 12.2 (94). GREENHILL, W. L. **The shrinkage of Australian timbers. 2.—Shrinkage data for 170 timbers.** *Pamphl. Coun. sci. industr. Res. Aust. No. 97 (Tech. Pap. Div. For. Prod. Aust. No. 35)*, 1940. pp. 48.

Shrinkage values for the more important Australian species are given in a form in which they can be readily used commercially. The laboratory method of making shrinkage tests is described and the application in practice of the results so obtained is discussed. The correlation between shrinkage and density amongst different Australian timbers is shown to be very small, and even within the one species the correlation of these two properties is not always significant. *Author's summary.*

31.22 : 31.2 : 12.2. REES, L. W., and BUCKMAN, S. J. **Effect of steaming on the physical properties of southern Pine.** *Proc. Amer. Wood Pres. Ass.* 36, 1940 (331-60). [University of Minnesota, St. Paul.]

A study was made of the effect of steaming for periods of 3-18 hours at temperatures of 214-260° F. upon certain physical properties of unseasoned Shortleaf and Slash Pine sapwood. (1) Steaming caused no significant change in specific gravity, with the possible exception of specimens steamed for 18 hours at 260° F., in which the specific gravity may have been slightly lowered. (2) There was only a slight darkening of the springwood and summerwood of specimens steamed up to 18 hours at 214° F. In the rest of the specimens, however, there was a progressive and appreciable darkening with increasing severity of the steaming conditions. The colour of the springwood changed from straw in the unsteamed specimens to khaki in the specimens steamed for 18 hours at 260° F., and that of the summerwood from leather-brown to chocolate under like conditions. (3) Radial and tangential shrinkage increased

with increasing severity of the steaming conditions, except for the specimens steamed for 9 hours or less at 214° and 230° F. (4) In general, linear relationships were found between moisture content and radial and tangential shrinkage of the unsteamed specimens and the specimens subjected to all of the different steaming conditions. (5) There was a change of sign in the effect of steaming on equilibrium moisture content throughout the relative-humidity range. Below a relative humidity of about 95 per cent., steaming reduced the equilibrium moisture content; above this, it caused an increase. There was an increase in the lowering of the equilibrium moisture content and an increase in the fibre-saturation point with increasing severity of the steaming conditions. Specimens steamed for 18 hours at 260° F. had about 1.5 per cent. lower equilibrium moisture content at 53 per cent. relative humidity and a fibre-saturation point about 4.6 per cent. higher than the unsteamed specimens. The effect of steaming on equilibrium moisture content was attributed to a progressive increase in the size of the capillaries in the cell walls as a result of an increased dispersion of the structural units. (6) The effect of steaming on the fibre-saturation point showed the same general trends previously obtained for losses in strength properties [*Proc. Amer. Wood Pres. Ass.* 34, 1938 (264-96)]. Increases in the fibre-saturation point are undoubtedly responsible for part of the losses in strength after steaming, but the evidence supports the conclusion that other changes are responsible for an appreciable part of the total strength losses. *From authors' summary.*

31.23. Weight. Specific Gravity

31.23 : 12.2 (944). **Weights of New South Wales timbers.** *Pamphl. N.S.W. For. Comm. Div. Wood Tech.* No. 2, 1940. pp. 16.

Both air-dry and green weights are given for 84 species. In a second table the timbers are arranged in weight classes according to basic density.

31.27. Mechanical Strength and Resistance

31.27. **Project 177: Standardization of tests of small clear specimens.** *Progress Report No. 2: Tests on compression parallel specimens of different length-breadth ratios.* Forest Products Laboratories of Canada, Ottawa. 1939. pp. 3. P.R.

These tests show that change in length-diameter ratio has little effect upon the crushing strength of 2.5×2.5 cm. specimens tested in compression parallel to the grain, the variation due to a change in specimen length from 2 in. to 4 in. being of no great importance in comparison with the natural variation between samples from the same tree. The results indicate that with the 2 in. specimen as a basis, the increase in crushing strength to be expected with specimens 3 in. long will be .21 per cent. and with specimens 4 in. long it will be .14 per cent. Advantages to be gained in using the four to one ratio: (a) extensometers may be used at this proportion and (b) end restraint is less.

31.3. Chemical Properties

31.3. PETTET, A. E. J., and LANE, F. G. **A study of the chemical composition of wood smoke.** *J. Soc. chem. Ind.* 59, 1940 (114-9). [Chemical Research Laboratory, Teddington, Middlesex.] P.R.

31.3. PLOETZ, T. **Enzymic degradation of polymeric carbohydrates. IV. Comparative degradation of some isolated constituents of wood by snail enzyme. V. Enzymic degradation of some natural materials containing lignin. VI. State of combination of lignin in wood.** *Ber.* 73 (B), 1940 (57-60, 61-73, 74-8). B.C.P.A. 1940, A., III (695). P.R.

31.3. TADOKORO, T., and KOBAYASHI, S. **On the chemical constituents observed in cellulose formation.** *J. Soc. chem. Ind., Japan* 42, 1939 (342B). [Hokkaido Imperial University, Sapporo.] L.S.

The cellulose and insoluble xylan contents of Red Beech (*Fagus* sp.) were found to be constant in their anhydride value as $C_6H_{10}O_5$: $C_6H_8O_4 = 3 : 1$, irrespective of the origin and age of the tree. In young Pine and Cedar trees of 5-15 years of age α -cellulose and lignin increased, while the alcohol-benzene extracts, acetyl-group, pentosan, and mannan decreased with increasing age.

31.3 : 31.1 : 12.11 : 12.14. ALLSOPP, A., and MISRA, P. **The constitution of the cambium, the new wood and the mature sapwood of the Common Ash, the Common Elm, and the Scotch Pine.** *Biochem. J.* 34, 1940 (1078-1084). [University of Leeds.] P.R.

The woods of the Common Ash, Common Elm and Scotch Pine were divided into three fractions: cambium + differentiating xylem, newly formed wood and mature sapwood. Analyses were made of each fraction. The composition of the cambium was found to be similar to that of other differentiating tissues, especially in the high pectin and relatively low lignin contents. There is some evidence that further slight changes occur in the composition of the wall after vessel differentiation is complete. *Authors' summary.*

31.3 : 33.32. BAILEY, A. **The chemistry of butanol lignin.** *Paper Tr. J.* 111 (9), 1940 (86-9). [University of Washington, Seattle.] P.R.

A brief survey of the chemistry of butanol lignin is given, including its physical appearance, solubility, molecular weight, thermal behaviour, salt formation and carbon and hydrogen content. The methoxyl content determination showed an increase from 19.7 per cent. for the original Aspen butanol lignin to 31.2 per cent. for the distilled fraction, a decrease from 15.2 to 10.9 per cent. for free Hemlock butanol lignin, and an increase from 8.9 to 9.8 per cent. for the total Hemlock butanol lignin. The principal reactions of butanol lignin reported are oxidation, acylation, alkylation, nitration, hydrolysis, sulphonation, alkaline fusion, reduction and catalytic hydrogenation, the latter yielding a dozen products distilling from 75° C. at atmospheric pressure to above 180° C. at 10⁻⁶ mm. of mercury. *Author's summary.*

31.4. Durability. Decomposition

31.42. Attack by Plant Organisms

31.42 : 12.11 : 12.2. BIRKINSHAW, J. H., FINDLAY, W. P. K., and WEBB, R. A. **Biochemistry of the wood-rotting fungi. 2. A study of the acids produced by *Coniophora cerebella* Pers.** *Biochem. J.* 34, 1940 (906-16). [Forest Products Research Laboratory, Princes Risborough, Bucks.]

31.42 : 12.12 : 12.2 : 13.2 (71.4). RILEY, C. G. **Decay in insect-killed Spruce in Gaspé.** *Pulp Paper Mag. Can.* 41, 1940 (611-2).

Sapwood decay of bark beetle-killed trees—in terms of total merchantable volume—increased with length of time after death, and amounted to 5.8 per cent. for trees that had

been dead for 4-7 years. About 40 per cent. of the decay occurred between stump and breast height.

31.42 : 12.2 : 33.36., VOGEL, F. H. **Some notes on the preparation of *Cyathus stercoreus* as a test organism for the rapid determination of decay resistance in treated timbers.** *Pap. Mich. Acad. Sci.* 25, 1939 [issued 1940], (179-85). [Michigan State College.] L.S.

C. stercoreus is recommended for further study as a useful addition to the test fungi already employed. When associated with soil bacteria in nature, or when grown in contaminated culture, its action is slow, but in pure agar culture the mycelium grows faster at temperatures of 21-27° C. than any other wood-rotting fungus tested on the same medium. Using the spread of the aerial mycelium of *C. stercoreus* as a criterion, it was possible within the space of one week to group 22 native American woods in an order that corresponded almost exactly with durability ratings published by the Forest Products Laboratory after lengthy research. The mycelium appeared to be sensitive to toxic substances in heartwood, and a culture on wood of the durable species *Catalpa speciosa* showed a sharp line between the two zones of wood, the sapwood carrying a heavy mycelial mat while the heartwood remained bare. General notes are included on the fungus and on the technique employed in the tests.

31.42 : 31.27 : 12.2 : 33.9. RICHARDS, C. A., and CHIDESTER, M. S. **The effect of *Peniophora gigantea* and *Schizophyllum commune* on strength of southern Yellow-Pine sapwood.** *Proc. Amer. Wood Pres. Ass.* 36, 1940 (24-31). [Bureau of Plant Industry, U.S.D.A.]

Laboratory tests were made to determine the effect of attack by *Peniophora gigantea* and *Schizophyllum commune* upon the strength properties of Loblolly and Slash Pine wood. The results show that *P. gigantea* is capable of reducing general strength properties to a considerable extent. *S. commune* gave more erratic results, but on the whole caused little or no decrease in strength except in work to the proportional limit. Though poles and other large timbers would not as a rule be so extensively attacked as the test pieces under laboratory conditions, the results emphasize the need

for storage under favourable seasoning conditions and for limiting the length of the storage period.

31.42 : 33.32. STAUDINGER, H., STAUDINGER, M., and SCHMIDT, H. **Macromolecular compounds. CCXXXVII. The destruction of cellulose by micro-organisms.** *Zellwolle, Kunstseide, Seide* 45, 1940 (2-4). Chem. Abs. 34 (2588). P.R.

Microscopic examinations of decaying wood show that the cell walls disintegrate. Although the lignin is destroyed, the average degree of polymerization of the wood may still be such that useful fibres can be produced from it.

31.43. Attack by Animal Organisms

31.43 : 13.2 : 32.2 : 32.8 (71). MORLEY, P. M. **Time of cut as a factor influencing infestation of coniferous logs.** *Canad. Ent.* 71, 1939 (243-8). R.A.E. A28 (379).

Logs of Pines, Spruces, and Balsam Fir were cut in eastern Canada at 14-day intervals between October 1936 and September 1937, placed on low racks clear of the ground so that each log was individually exposed; and examined in September 1937 and August 1938 for attack by 18 Coleoptera and *Sirex cyaneus* F. A definite relation was found between infestation and time of cutting. The flight period of each insect differed both in time of occurrence and in duration; the food preference for logs at different stages of seasoning also varied from species to species, hence it is possible to deduce from the nature of the insect attack the time of year at which the log was cut. Most bark beetles preferred freshly cut logs, but *Ips* (*Orthotomicus*) *caelatus* Eichh., which attacks Pine and Spruce, was an exception. Ambrosia beetles (*Gnathotrichus materiarius* Fitch. in Pine and Spruce, and *Trypodendron lineatum* Ol. in Pine, Spruce, and Balsam Fir) appeared early in spring and preferred slightly seasoned logs cut in late summer and autumn. The Lamiids *Monochamus scutellatus* Say, *M. notatus* Dru., and *M. titillator* F., which are considered the most destructive pests of unseasoned conifer logs in the region, will readily attack logs cut at all seasons. Logs cut late in summer are not attacked by sapwood borers (*Sirex* and *Serropalpus*).

31.43 : 33.36 : 13.2 (410). **Beetles injurious to timber and furniture.** *For. Prod. Res. Bull., Lond.* No. 19, 1940. pp. 36.

A revised edition of a bulletin published by H.M. Forestry Commission in January, 1928, 'Beetles Injurious to Timber' by Professor J. W. Munro. Bulletin deals with the longhorn woodborers, the pinhole borers of the families Scolytidae and Platypodidae, the powder post beetles of the families Bostrychidae, the furniture beetles of the Anobiidae, and also some miscellaneous examples of Coleoptera which affect timber subsequent to attack by fungi. The data on all sections have been brought up to date, and all the most important results of the research of the last decade have been included in its pages, especially as regards practical hints for the recognition and control of damage caused by the beetles and their grubs.

32. HARVESTING OF WOOD. LOGGING

32.1. Marking of Trees and Coupes

32.1 : 21.6 : 24.3. KRAUCH, H. **Vigor, release, and tree form as guides to marking.** *J. For.* 38, 1940 (595). [Southwestern Forest & Range Exp. Sta.]

In tree selection the timber marker should be able to distinguish between pathologically unhealthy trees and those that have an unhealthy appearance due to unfavourable environmental conditions that can be altered. While age, apparent vigour and size of crown, which form the basis of a number of tree classifications, indicate the apparent growth capacity of the tree, the potential vigour and release of a tree will have an important influence on its future development. Tree form, as a guide to quality production, should also be considered in timber marking.

32.2. Felling. Extraction

32.2 Syrfällning vid vedhuggning. [**Summer felling of firewood.**] *Skogen* 27, 1940 (212). [Sw.]

A research committee on the buoyancy of wood has reported that the practice of leaving summer-felled trees to dry out with crowns intact is unsuitable for conifers, as their stomata close soon after felling and transpiration practically stops. Drying appeared to be quickest if felling was done in a moist period, presumably because the stomata were already well open. Probably owing to movement of water within the tree, some drying occurred in the butts of trees felled as late as August and even September, and this was sufficient to render the butt logs floatable, though the

middle and top logs showed no noticeable drying. It is suggested that summer felling might be worth reviving in view of the urgent need for firewood fellings. The risk of decay would not be an important factor and the wood should be dry enough for use, especially if stored under a roof after conversion. Fellings by this method should be made only where there would be little shelter or shade from the remaining stand. The butt must be completely severed from the roots, and felling should begin only when the foliage has developed fully and the rise of sap has ceased.

32.2 : 32.5 : 07.7. SPANGLER, F. L. **Cut logging costs, promote safety—with pre-formed wire rope.** *Sth. Lumberm.* 161 (2027), 1940 (41-2).

For constant operation over sheaves and drums the pre-formed rope has advantages over non pre-formed rope including increased life, ease in handling, greater flexibility, reduced effect of bending fatigue, and less tendency for strands to unlay or for broken strands to stick out from the rope. Flexibility is combined with resistance to abrasion in pre-formed Lang lay rope, in which the strands are spiralled into the rope in the same direction as the individual wires are spiralled into the strand. Pre-formed rope is not recommended for use in a relatively stationary position.

32.2 : 33.32 : 01 : 07.7 (71). KOROLEFF, A. **Pulpwood cutting (technique and equipment).** *Pulp Paper Mag. Can.* 41, 1940 (406-10, 453-60, 503-7).

Cutting is the largest single item of expense in pulpwood production, representing at least 20 per cent. of the total cost of prepared wood at the mill. In Canada this work is done almost entirely by hand and production varies widely depending on logging conditions, intrinsic characteristics and the technique of the cutters, and the selection and fitting of tools. An investigation of cutting has been proposed with the object of improving technique and tools and so increasing efficiency and economy. A brief review is given of present conditions and possible improvements with reference to working procedure, tools and their fitting, mens' safety in cutting, elementary silviculture and wood-waste reduction, and instructions in cutting.

Replies from pulp and paper companies to a questionnaire on the types of bucksaws, axes

and pulphooks now in use are tabulated and analysed. Canadian experience in the use of machinery for felling and cross-cutting is discussed briefly with particular reference to the use of motor saws. A note is included on 'Desirable properties of steel for cutting tools and on Rockwell hardness test of axes' by Prof. G. St. G. Sproule.

32.2 : 33.32 : 07.7. WHITNEY, R. L. **Barking pulpwood.** *Pulp Paper Mag. Can.* 41, 1940 (670-2). [Maine Seaboard Paper Co.]

32.2 : 32.5 : 33.32 : 07.7 : 12.2. HUTCHINS, C. M., and ARMSTRONG, V. L. **Mechanical barking of Maine hardwood pulpwood.** *Pulp Paper Mag. Can.* 41, 1940 (672-3). [Passamaquoddy Land Co.]

32.2 : 32.5 : 33.32 : 07.7 : 12.2. KELLEY, F. A. **Summary report of our experience with the Council barker.** *Pulp Paper Mag. Can.* 41, 1940 (673-4, 680). [Northwest Paper Co., Cloquet, Minn.]

The first of these papers includes brief notes on the various barking methods, the most important of which are sap peeling (hand work), drum barking (stationary unit), and machine barking with portable barker (unit mounted on sledge). Sap peeling fits in best with many modes of transportation and is considered the best all-round method provided sufficient labour is available during the season of sap flow. Drum barking is probably the cheapest method when water transportation and storage is available and the other equipment at the mill adapted to its use. Barking with portable units is the most expensive method, but is justified in certain instances. Experience with portable machines is reported in the second and the third paper, dealing respectively with experimental barking of hardwood using an up-to-date Crouse 'knives in revolving head type' barker and of Spruce with a 'hammer type' Council barker.

32.2 : 37 : 07.7. **Safety pole. Device prevents logs rolling wrong way.** *Timberman* 41 (10), 1940 (26).

A 12 ft. straight-grained pole, about 5 in. at top and 7 in. at butt is ferruled top and bottom, the bottom ferrule having a spike to hold the pole in the ground. One or two chains anchored to the top ferrule can be hooked at the lower end to the truck coupling. The pole is straightened to the perpendicular and the chains become taut against the log load.

33. CONVERSION AND PRESERVATION
OF WOOD

33 : 09.4 : 98.1 (74.8). LEACH, W. **Wood utilization in Adams County.** *For. Leaves* 30 (4), 1940 (1-2, 13-5).

An analysis of data obtained in a wood utilization survey of Adams County, Pennsylvania.

33.13. Cooperage. Shingles

33.13 : 33.0 : 12.2 (66.9). MACKAY, J. H. **On the possibilities of 'rough' shingle roofs in Southern Nigeria.** *Niger. For.* 1, 1940 (6-10).

Discussion of the opportunity and technique for using hand-riven shingles made from local material.

33.15. Manufacture of Veneers
and Laminated Wood.
Gluing

33.15. TRUAX, T. R. **The manufacture of veneer.** Forest Products Laboratory, Madison, Wis. No. R285, 1939. pp. 5.

33.15. JABLONSKY, B. **Improvements in and relating to plywood.** *British Patent* No. 502,413. *Building Sci. Abs.* (n.s.) 13 (202). P.R.

At least two plies are separately compressed, at a temperature below that at which scorching of the wood occurs, to increase their density, and without impregnating them individually with a polymerizable product; the plies are then cemented together under low pressure and with the direction of their fibres extending transversely to one another. One or more of the plies may be built up of a plurality of veneer sheets, cemented together with their fibres all substantially parallel.

33.3. Chemical Treatment

33.3. KAUFFMANN, H. O. [to Buffalo Electro-Chemical Co.]. **Bleaching wood.** *U.S. Patent* No. 2,191,431, Feb. 20, 1940. *Chem. Abs.* 34 (4569). P.R.

A solution is used containing a peroxide such as H_2O_2 and a pyrophosphate such as tetra-Na or di-Na pyrophosphate.

33.3 : 31.22. STAMM, A. J., and PETERING, W. H. **Treatment of wood with aqueous solutions: effect of wetting agents.** *Industr. Engng. Chem. (Industr. Ed.)* 32, 1940 (809-13).

[Forest Products Laboratory, Madison, Wis.] P.R.

Wetting agents have no practical value in increasing either the rate of absorption or the rate of swelling of wood in water or aqueous solutions under ordinary soaking conditions. After the first few minutes capillary rise is the controlling factor in determining the rate of water absorption, and diffusion into the cell walls is the controlling factor in determining the rate of swelling. *Authors' summary.*

33.3 : 31.27 : 31.22. ERICKSON, H. D., and REES, L. W. **The effect of several chemicals on the swelling and the crushing strength of wood.** *J. agric. Res.* 60, 1940 (593-603). [Minnesota Agricultural Exp. Sta.] O.R.E.

A definite inverse relationship was found between the swelling of wood and its maximum crushing strength when the swelling agents were organic liquids, chiefly alcohols. For the same degree of swelling, the blocks in organic liquids were stronger than those swollen with water vapour or liquid. The lower alcohols caused the greater swelling and loss of crushing strength, the higher the least. Benzene did not cause swelling or appreciably affect the strength of oven-dry wood. More than 120 days were required for swelling of wood in *n*-butyl alcohol to reach equilibrium. The amount of swelling caused by concentrated solutions of inorganic salts was in general agreement with the solubility of the salts and the lyotropic series of ions as found by other workers. Some of these solutions increased the strength of the wood; a few decreased it. The chloride series caused an increase. In the organic group, urea, resorcinol, and pyrogallol markedly decreased the crushing strength of wood; whereas chloral hydrate, which swelled wood the most, and tannic acid, decidedly increased the strength. Very little radial swelling occurred beyond the green dimension, and in several aqueous solutions radial contraction took place. The degree of swelling does not appear to be a dependable criterion of the change in crushing strength of wood; specific effects of the chemicals often dominate the results. *Authors' summary.*

33.32. Pulp and Paper
Manufacture

33.32. JESSUP, D. A., WEBER, C. G., and WEISSBERG, S. G. **Stability of fiber building**

boards as determined by accelerated aging. *Rep. U. S. Bur. Stand.* No. BMS 50, 1940. pp. 6. P.R.

The apparent stability of a number of fibre building boards of current manufacture was determined by observing their resistance to accelerated aging, outdoor weathering, and attack by rot-producing fungi. [Cf. *For. Abs.* 1 (96)]. Accelerated aging produced large increases in water absorption of some of the boards and in water permeability of most of the boards, which indicates that they should not be depended upon to function as a moisture barrier. The aging produced significant changes in air permeability for most of the boards having special surfaces for interior finish, though periodic redecoration should prevent decrease in serviceability as a result of this kind of deterioration. Changes of nail-holding strength and flexural properties were not, in general, large enough to be considered serious under the aging treatment. The fibre boards are apparently no more susceptible to damage from the growth of rot-producing fungi than are the woods used in house construction. Treatment of the boards with a wood preservative will improve their resistance to fungi. The results indicate that this type of board is not suitable for the exterior covering of buildings. *From authors' summary.*

33.32 : 34.6. LEE, J. A. **New products from wood.** *Chem. metall. Engng.* 47 (2), 1940 (95-8). L.S.

A popular account is given of the Masonite process for manufacturing fibre boards. Wood is subjected to a steam pressure of 1,000 lb. per sq. in. and subsequently exploded by suddenly releasing the pressure. The resulting fibre is made up into various standard types of fibre board. The company is now developing the production of a very dense activated carbon and moulded plastic containers. Processes for the recovery of various chemicals from waste liquors are also being tested on a semi-factory scale, and a new method has been developed of recovering furfural, acetic, and formic acids.

33.32 : 12.2. CURRAN, C. E. **Hardwoods and the semichemical pulping process.** *Pulp Paper Mag. Can.* 41, 1940 (665-8). [Forest Products Laboratory, Madison, Wis.]

This process, developed some 15 years ago at Madison, allows of the production of excellent newsprint papers from semi-chemical hardwood pulps combined with coniferous ground-

wood. Mill-scale experiments are necessary to establish definitely the commercial possibilities of such newsprint. The use of semi-chemical hardwood pulps for the manufacture of corrugated boards is already an established industrial process.

33.32 : 12.2 (52). MIGITA, N. **Pulpwoods and pulps. II. Manufacture of pulps from Manchurian Spruce, Fir, and Aspen (*Picea obovata*, *Abies nephrolepis*, and *Populus maximowiczii*).** *Cellulose Ind., Tokyo* 15, 1939 (54-8). *Chem. Abs.* 34 (2591). P.R.

33.32 : 12.2. HAFFNER, L. C., and KOBE, K. A. **Douglas Fir as a pulpwood.** *Paper Tr. J.* 111 (9), 1940 (93-8). [University of Washington, Seattle.] P.R.

The conditions have been determined under which Douglas Fir can be pulped by a modified sodium sulphite process to give a high-grade pulp, characterized by high tear values and good burst (Mullen) with easy bleachability. Western Hemlock can also be pulped under similar conditions to give a pulp with burst values approaching sulphate, good tear, and easy bleachability. *From authors' summary.*

33.32 : 12.2 (729.7). **Young Teak for paper-making from Trinidad.** *Bull. Imp. Inst., Lond.* 38, 1940 (285-9).

Young Teak wood has little value as a raw material for paper-making owing to the short length of the ultimate fibres and to the difficulty in obtaining an easy-bleaching pulp.

33.32 : 31.3. KHINCHIN, Ya. G. **The significance of hemicelluloses in pulp and paper production. II. Mannans.** *Bumazhnaya Prom.* 18 (1/2), 1940 (7-11). [R.] *Chem. Abs.* 34 (4902). P.R.

33.32 : 98.1 : 09.4 : 97.4. WOLF, R. B. **Utilization problems of pulp and paper industry.** *J. For.* 38, 1940 (703-10). [Weyerhaeuser Timber Co.]

An analysis of data on imports, exports, consumption and production of pulp, particularly sulphite and sulphate, in the United States, and of figures for other pulp-producing countries where these affect the American market. It is pointed out that the pulp mills on the west coast of the United States can use relatively small logs, which, under present scaling rules and logging methods, are being left in the woods as waste.

33.35. Seasoning. Drying

33.35-6 : 31.42 : 12.2 : 98.3 (71.1). EADES, H. W. **Sap-stain, mould, and decay in relation to export shipments of British Columbia softwoods.** *Circ. Dom. For. Serv.* No. 57, 1940. pp. 12.

Seasoning to a moisture content of 25 per cent. or less before shipment is the most suitable method of preventing damage by sap-stain, mould, and wood-rotting fungi during transit overseas. Even seasoning to a uniform moisture content of about 30 per cent., or surface drying, in the case of larger timbers, would help to retard attack. Chemical sprays or dips are a useful means of helping to control these fungal growths during transit, but in order to ensure their efficacy, lumber should be at least partially seasoned following the treatment. Sap stain and mould will not affect lumber either properly air seasoned or kiln dried before shipment provided that it is kept dry during the voyage and after arrival at its destination. *From author's summary.*

33.35. TIEMANN, H. D. **How to conduct a kiln-drying run: what to do, and a few short cuts.** *Sth. Lumberm.* 161 (2025), 1940 (41-4).

33.35 : 33.15. **Quick drying and gluing by new electric process.** *Sth. Lumberm.* 161 (2024), 1940 (27).

This process, which appears to be particularly suited to the drying of thick stock and to the gluing of laminated material, has been developed by the Thermal Research Corporation of Richmond, Va. and is still in an experimental stage. It consists in the application of a high-frequency field to the wood being treated. The lumber or plies are placed between electrodes connected to a high frequency unit, and the high-frequency current, while not passing through the wood, has the effect of setting up temperatures of from 200° to 250° within the wood, which can be dried to any desired moisture content in minutes. Gluing can be accomplished almost instantaneously.

33.35 : 33.15. BERKNESS, I. R. **The high-frequency method for gluing and drying wood.** *Sth. Lumberm.* 161 (2025), 1940 (25-6). [Thermal Engineering Corporation, Richmond, Va.]

By this process glue reaches the polymerizing temperature at a much lower wood surface temperature than by the usual hot press

method. This results in less cooling time under pressure and reduced cooling stresses. Furthermore, gluing time is so short that there is no apparent moisture loss in the wood itself, and is practically the same whether the stack of plies is $\frac{1}{2}$ in. or 2 ft. thick. Additional advantages may be obtained by using heat-setting glues. All types of woods can be dried to a uniform moisture content with a minimum of degrade and at a marked reduction in time from the conventional kiln method. Also thick sections of resin-impregnated wood or fibrous material may be uniformly cured and cooled in a relatively short time. It is pointed out that existing presses can be adapted for use with this process.

33.35 : 33.31. **Checking, splitting and honeycombing reduced by urea treatment. Chemical treatment reduces degrade in both air-drying and kiln-drying.** *Sth. Lumberm.* 161 (2025), 1940 (47).

Urea applied to green lumber penetrates the outer shell and keeps it in a relatively moist and swollen condition while the inside of the lumber dries. Urea may be applied in three ways : (a) spread on as a dry crystal powder, (b) as a 30 or 40 per cent. aqueous solution in which the lumber is soaked, and (c) as a 50 per cent. solution for dipping or spraying. Instructions as issued by Du Pont Co. for each type of application are quoted. Tests have shown that in general about 40 pounds of urea per 1,000 bd. ft. of lumber gives satisfactory results. Urea is not corrosive to metals, does not dull tools, does not promote insect or fungus attack, in general, does not affect natural colouring of wood, does not decompose or deteriorate in storage, and is commercially available at low cost.

33.35 : 33.31. BERLINER, J. F. T. **Urea as an aid to lumber seasoning.** *Timberman* 41 (11), 1940 (36-8). [Ammonia Department, E. I. du Pont de Nemours & Co.]

Successful treatments have been made with Douglas Fir, Hemlock and Cypress and experiments are being conducted with other woods. Wood should be treated as soon after sawing as possible in order to take advantage of the relatively high green moisture content of the wood as an aid to urea penetration. When green moisture content is low it may be necessary to apply additional water to the wood by sprinkling before applying urea or by steaming in

kiln after application. After dip or spray treatment, lumber may be bulk piled for a few days before stacking for drying in order to get proper penetration of the urea. Additional advantages of this treatment (note previous abstract) are that it does not cause 'sweating' in treated lumber after the drying period, it adds a certain amount of flame retardance to wood, and it is non-poisonous and harmless to the skin.

33.35 : 33.31 : 12.2. LOUGHBOROUGH, W. K. **Chemical seasoning of Overcup Oak.** *Sth. Lumberm.* 159 (2009), 1939 (137-40). [Forest Products Laboratory, Madison, Wis.]

Overcup Oak (*Quercus lyrata*) is a difficult wood to season, as small-dimension stock tends to warp badly and honeycombing increases seriously with width of plank. Chemical pretreatment of stock, consisting of immersion in a saturated solution of common salt, at temperatures of 110° F. for stock 1 in. or 2 in. thick and 100° F. for stock 3 in. thick, for periods varying between 5 and 34 days according to the dimensions of the material, was highly effective in reducing honeycombing, the net yield of sound squares from treated material—both air- and kiln-dried—being about 60 per cent., whereas that from matched untreated controls varied between 3 and 32 per cent. It was found undesirable to dry 2-in. and 3-in. wood as squares, as these warp more than planks or half-planks. If squares were to be cut from 3-in. planks, the yield was greater from stock dried as 6-in. widths than from that dried in widths of 12 in. It is emphasized that these results are of a preliminary nature and that further research must be done on a semi-commercial scale. Moreover, a chemical process adapted to a particular product of one species may be unsuitable for a similar product of another species or a different product of the same species; thus the results of salt treatment of Oak railway ties were far from satisfactory.

33.35 : 33.36 : 33.51 : 33.9 : 12.2. SMILEY, G. R. **Stacking, seasoning and treatment of Gum lumber for railroads.** *Proc. Amer. Wood Pres. Ass.* 36, 1940 (208-11).

Before 1926 the wood of various species of *Nyssa* was used for sleepers on the Louisville and Nashville railway system, but since that year purchases have been restricted to interlocked-grain, sap-bound Black Gum (*N. sylvatica*), which is the most dependable for economic service. At present the lumber is used for sleepers, flooring and decking, and

many other purposes requiring hard wear. In lumber over 3 in. in thickness the heartwood must be completely cased in sapwood; smaller dimensions must have one sap face with the sapwood extending to half the thickness of the piece. Autumn- and winter-felled timber seasons the most readily; as soon as possible after felling the logs should be sawn and stacked for air seasoning, which takes from 5 to 8 months. The air-seasoned lumber is treated by the Rueping process to give a net retention of 7 lb. of creosote per cu. ft. of wood. If clean, dry lumber is required, the creosote treatment is followed by a steam bath and vacuum process. An 80 : 20 creosote/coal-tar mixture was formerly used, but creosote alone has proved to give better distribution in the wood. Of 259 sleepers installed in 1927, 8 showed internal decay but were still good after 12½ years of service.

33.36. Preservation of Wood. Impregnation

33.36 : 07.7. LINDGREN, R. M. **A handy dipping vat for portable and semi-portable mills.** *Sth. Lumberm.* 159 (2009), 1939 (136).

The vat is a rectangular trough about 3 ft. wide, 1½ ft. deep, and 22 ft. long, placed towards the end of, parallel to, and about 3 ft. lower than the roller bed of the saw bench. To the edge of the roller bed are fixed lengths of iron piping that slant down into the vat, straighten out for a short distance about 6-8 in. from the vat bottom, and then curve gradually up and out on the farther side. The boards are dropped in succession on to this simple chute, the impact and weight of each fresh board usually sufficing to move the chain of preceding boards in and out of the dipping solution. In the vat described and illustrated, about 15-20,000 bd. ft. were handled daily. The process is cheaper than hand dipping and does not bring the operator's hands into contact with the solution.

33.36 : 09.4 (73). HELPHENSTINE, R. K. **Quantity of wood treated and preservatives used in the United States in 1939.** *Proc. Amer. Wood Pres. Ass.* 36, 1940 (422-46).

33.36 : 12.2. FINDLAY, W. P. K. **Discoloration of paint caused by mould growth and its prevention.** *Journal of the Oil & Colour Chemists' Association* 23 (242), 1940 (217-32). [Forest Products Research Laboratory, Princes Risborough, Bucks.]

33.36 : 12.2. **The incising of Douglas Fir.** *Wood Pres. News* 18, 1940 (112-5). P.R.

Douglas Fir structural timbers consist largely of heartwood, and the now common practice of incising them before treatment has greatly improved creosote penetration and distribution. Besides having no appreciable effect upon the strength of timbers, the incisions help to reduce checking and splitting. Incising is done by a machine with four revolving drums carrying incisor teeth which cut into all four surfaces of the timber at once. The incisions are about $\frac{3}{8}$ in. long and $\frac{1}{8}$ in. wide; they are spaced about $8\frac{1}{2}$ – $9\frac{1}{2}$ in. apart along the grain and about $\frac{3}{4}$ in. apart across it, as penetration is considerably better in the longitudinal than in the transverse direction. The American Railway Engineering Association specifies a $\frac{3}{4}$ -in. depth of cut for all sawed Douglas Fir 6 in. and over in thickness, and a $\frac{1}{2}$ -in. depth on the sides with a $\frac{3}{4}$ -in. depth on the edges of all Douglas Fir between 2 and 6 in. in thickness. The American Wood-Preservers' Association requires a $\frac{1}{2}$ -in. penetration of preservative for Douglas Fir of 5 in. and over in thickness, and $\frac{3}{8}$ -in. for timbers under 5 in., though the actual penetration often exceeds this amount.

33.36 : 31.43 : 12.2 : 13.2. CHRISTIAN, M. B. **Experiments on the prevention of ambrosia beetle damage in hardwoods.** *Sth. Lumberm.* 159 (2009), 1939 (110-2). [Chicago Mill & Lumber Co., Tallulah, La.]

Experiments in Louisiana indicate that ambrosia beetles will not attack 1-in. Sweet Gum (*Liquidambar styraciflua*) lumber at moisture contents of 48 per cent. or lower, and that end-racking the lumber for 8-12 days before piling will prevent much of the damage caused in unseasoned piles. In tests with a large number of chemical sprays, four new treatments were found to be far better than any of the older chemical sprays that had shown most promise in previous tests. Three of these—para-tertiary-butyl-phenoxy-ethanol 25 per cent., kerosene 75 per cent.; para-chlor-phenoxy-ethoxy-ethyl-chloride 25 per cent., kerosene 75 per cent.; and ortho-nitro-diphenyl 25 per cent., benzol 75 per cent.—were effective in preventing attack by both ambrosia beetles and sap-staining fungi. The fourth—dichloro-diphenyl-oxide 25 per cent., kerosene 75 per cent.—was effective against the beetles but seemed to have little value against sap stain.

33.36 : 31.43 : 13.2. **Chemical dips tests**

against *Lyctus* powder-post beetles, *Lyctus parallelopidus* (Melsh.) and *L. planicollis* Le Conte. *Sth. Lumberm.* 159 (2009), 1939 (105-9).

Water-soluble chemicals, applied as 10-second dips, that prevented infestation by both species of beetle were: (i) sodium silico-fluoride in 5 per cent. solution; (ii) 'Sulfocide' at the same strength; and (iii) sodium dinitro-o-cyclohexylphenate at 2 oz. per gal. Other solutions that prevented attack by *L. parallelopidus*, but permitted slight infestation by *L. planicollis*, were: (i) borax in 2.5-10 per cent. solution; and (ii) sodium dinitro-o-cyclohexylphenate at $\frac{1}{2}$ oz. per gal. Dinitro-o-cyclohexylphenol was effective against the former species in concentrations as low as $\frac{1}{8}$ oz. per gal., but was not tested against the latter. Borax should be the best chemical for commercial use, as it is cheap, harmless to man, and does not affect the finishing of treated material. Preliminary penetration studies suggest that the depth achieved with a 10-second dip at 130° F. could be roughly doubled at 190° F., and as lack of penetration was apparently the cause of inadequate resistance to *L. planicollis*, further tests may prove borax to be effective, in 5 per cent. solution at 190° F., against both beetles. Of oil-soluble substances, pentachlorophenol was the best, the air-dried lumber being dipped for 10 seconds in a 2 per cent. solution of the chemical in light fuel oil. Further treatment is necessary if the lumber is later re-worked or surfaced. All stages of the beetles can be destroyed, if already present in lumber of 1 in. or less thickness, by a 3-minute dip in a 3 per cent. solution of pentachlorophenol in light fuel oil. [Cf. *For. Abs.* 2 (152)].

33.36 : 31.43 : 13.2. HUNT, G. M., and SNYDER, T. E. **An international termite exposure test—eleventh progress report.** *Proc. Amer. Wood Pres. Ass.* 36, 1940 (378-91). [Forest Products Laboratory, Madison, Wis.]

33.36 : 31.43 : 45.3 : 12.12 : 13.2. SNYDER, T. E. **Preventing damage by termites or white ants.** *Fmrs' Bull. U.S. Dep. Agric.* No. 1472, [revised ed.] 1939. pp. 21. [Bureau of Entomology & Plant Quarantine, U.S.D.A.]

The third edition of a semi-popular bulletin on the biology of N: American termites and the prevention and remedying of termite damage to woodwork and living vegetation.

33.36 : 31.45. **Report of Committee 9—Fireproofing.** *Proc. Amer. Wood Pres. Ass.* 36, 1940 (392–402).

This report includes revised descriptions of the vertical flame-spread test and the flame-penetration test, as issued by the U.S. Bureau of Standards.

33.36 : 31.45. **ETABLISSEMENTS BOUILLON FRÈRES. Improvements in or relating to a method of manufacture of a fireproofing material and to its application.** *British Patent No. 504,480. Building Sci. Abs. (n.s.)* 13 (203). P.R.

A process of fireproofing objects consists of treating the objects with a composition obtained by the reaction between an aluminium salt, an oxygenated acid or a sugar or a polyhydric-alcohol and ammonia. The objects may be subsequently coated with a mixture of silicates, aluminates and asbestos or chlorinated rubber.

33.36 : 33.31. HUDSON, M. S., and BAECHELER, R. H. **The oxidation of creosote—its significance in timber treating operations.** *Proc. Amer. Wood Pres. Ass.* 36, 1940 (74–111). [Forest Products Laboratory, Madison, Wis.]

Investigation has shown that: (1) Oxidation largely accounts for the changes that occur in creosote during pressure treatments. (2) Complete exclusion of oxygen seems necessary if such changes are to be substantially reduced. (3) Different creosotes vary widely in oxidizability and this variation appears to be related to differences in their content of tar acids. (4) Removal of tar acids affects the greatest reduction in oxidizability, and the further reduction after removal of tar bases is slight. (5) For a given creosote a definite amount of oxygen is required for a given change in any physical property, regardless of pressure between 50 and 150 lb. (6) The types of oxidation reactions occurring in different high-temperature tar creosotes are probably the same. (7) Though oxidation considerably altered the physical properties of creosote, corresponding changes in toxicity were not observed except in creosotes of high tar-acid content, which decreased in toxicity. (8) Calculation of initial absorption of creosote from the amounts extracted and percentage of residue after prolonged service may yield highly erroneous results because of the oxidative condensation of low-boiling compounds to

compounds distilling above 355° C. *From authors' summary.*

33.36 : 33.31 : 31.43. POTTER, C., and MUSGRAVE, A. J. **Some preliminary experiments with β -butoxy- β' -thiocyanodiethyl-ether as an industrial insecticide.** *Ann. appl. Biol.* 27, 1940 (110–21). [Imperial College of Science, London.] P.R.

Tests on the toxicity of this substance (normal butylcarbitolthiocyanate) to various indoor insect pests indicate that it is toxic as a spray and can be made to form a toxic film on wooden surfaces under suitable conditions. It appears to have considerable promise as an industrial insecticide, either alone or mixed with other toxic substances, e.g. pyrethrum or derris.

33.36 : 33.4 : 33.8. LINDSLEY, D. L. **The use of pressure treated lumber in the construction of roofs for water storage reservoirs.** *Proc. Amer. Wood Pres. Ass.* 36, 1940 (248–61). [West Coast Wood Preserving Co.]

Creosoted roofs for water reservoirs are an economic proposition, and, at least where properly ventilated, the water is not affected by drip. So far, creosote has been the only preservative used, but recent tests indicate that chromated zinc chloride and possibly other water-soluble preservatives could be used with no risk to human health. Some constructional details are given and a table is presented to show details of various pressure-creosoted roofs in California.

33.36 : 33.4 : 38. TROUT, G. H. **Preframing of treated timber for use in bridges.** *Proc. Amer. Wood Pres. Ass.* 36, 1940 (200–5).

A general account, from the engineering point of view, of the preparation and use of prefamed timber for bridges on the Union Pacific railways. The cost of obtaining field information and preparing prefaming plans is stated to be more than offset by the additional life of the timber.

33.36 : 33.4 : 33.51 : 12.2. **American Wood-Preservers' Association Manual of Recommended Practice. 53a. Standard specification for the preservative treatment of southern Pine ties and lumber by pressure processes.** *Proc. Amer. Wood Pres. Ass.* 36, 1940 (129–34).

33.36 : 33.4 : 33.51 : 12.2. **American Wood-Preservers' Association Manual of Recommended Practice.** 38b. Standard specification for the preservative treatment of Pacific Coast Douglas Fir ties and lumber by pressure processes. *Proc. Amer. Wood Pres. Ass.* 36, 1940 (113-9).

33.36 : 33.51. BOLLER, E. R. **Zinc chloride-petroleum treatment for ties.** *Proc. Amer. Wood Pres. Ass.* 36, 1940 (361-76). [E. I. du Pont de Nemours & Co., Grasselli Chemicals Dept., Cleveland, Ohio.]

An account is given of experiments on the treatment of railway sleepers of Red and White

Oak, Western Yellow Pine, Lodgepole Pine, and Douglas Fir, using zinc chloride introduced by the Rueping process followed by a full-cell treatment with petroleum or coal tar. Results indicate that it is possible to secure satisfactory treatment by this method. Details of the various treating schedules and of the results obtained are given in tables.

33.36 : 33.51. HARRIS, G. W. **What we can expect from treated ties.** *Proc. Amer. Wood Pres. Ass.* 36, 1940 (188-98).

On the Santa Fé railways the average life of sleepers, by kinds of treatment has been as follows:—

Kind of treatment	No. of ties in calculation	Placed in track	Average expected life in years
Zinc chloride	314,252	1886-1925	13-47
Zinc chloride/petroleum, two movement	13,463	1915-1926	19-48
Zinc chloride/petroleum emulsion, Howald process	2,926	1925-1926	19-76
Zinc chloride followed by 30 : 70 creosote/petroleum mixture	16,851	1922-1926	20-76
Creosote, 5 lb. net retention	790,034	1904-1929	27-88

Since 1924 the system has adopted standard pressure treatments giving a net retention of 8 lb. per cu. ft., the preservatives used being either 50 : 50 or 45 : 55 creosote/petroleum mixtures. The figures for these are not yet extensive enough for inclusion in the above table. The general trend of progress in preservative treatment and in other factors influencing durability is indicated by the figures for sleeper renewals per mile of track, which averaged 211 in the period 1899-1903, but have been progressively reduced to 100 in the period 1934-8. Over the same periods the indicated average life based on 3,036 sleepers per mile for all tracks has been raised from 14.39 to 30.36 years.

33.36 : 33.51 : 09.4 (73). **Report of Committee 7-1—Tie service records.** *Proc. Amer. Wood Pres. Ass.* 36, 1940 (273-305).

Reports on the condition of experimental ties, representing different species, treatments, length of treatment and location, are tabulated.

33.36 : 33.51 : 31.42 : 12.2 (410). HARDY, E. **Pit-prop fungi.** *Colliery Engng.* 17, 1940 (116-7). R.A.M. 19 (633).

The commonest pitprop fungi in British mines are *Merulius lacrymans*, *Poria vaporaria* (*P. vaillantii*), and *Coniophora cerebella* (*C. puteana*). *Lenzites sepiaria* also gives trouble,

especially on Pine wood, but unlike *M. lacrymans*, it cannot attack hardwoods. With excessive warmth and humidity *Fomes annosus* is the chief cause of decay in Pine and other softwoods, while *Polystictus versicolor* is found on Oak and other hardwoods. Waterlogged props of any sort are liable to attack by *Armillaria mellea*, the advance of which may be so rapid as to necessitate renewal of the props within 6 months. *M. lacrymans* may be controlled with creosote (also effective against *A. mellea*), tar, boric acid, or the dinitrocreosates of potassium or sodium.

33.36 : 33.51 : 33.31. EDWARDS, J. H. **Treating method.** *Coal Age* 44 (10), 1939 (53-5). B.C.P.A. 1940, Sec. B (446). P.R.

The preservation of Pine pitprops by the Osmose process is described. The wood is dipped in H₂O containing a compound made up of 78 per cent. NaF, 3 per cent. K₂Cr₂O₇, 14 per cent. dinitrophenol, and 5 per cent. gum arabic. Na₃AsO₄ is added for protection against termites if desired. Treatment costs are given.

33.36 : 33.52 (52). NAKAZIMA, Y., and SUZUKI, S. **The rapid deterioration of copper-sulphate-impregnated poles and other related problems.** [Abstr. of paper in *J. Inst. elect. Comm. Engrs. Japan*, 1939.] *Nippon*

Electrical Communication Engineering No. 20, 1940 (267-8). [E.]

Rapid deterioration of poles impregnated with copper sulphate and erected in a certain district of Japan was found to be due to leaching of the preservative by alternately dry and moist soil conditions. A commercial preserving band was tried, but was no more effective than the procedure of scraping away the rotted portion and coating it with creosote. Poles impregnated with creosote by the Bessel process are best suited to this kind of soil. It is stated that in copper-sulphate treatment too much attention has been paid to the retention per cu. m., while uniformity of cross-sectional penetration has been neglected. The present belief is that by diluting the present solution to a concentration that should deposit 3-4 kg. of copper sulphate [per cu. m.?] and by securing uniform penetration, the degree of protection should be the same as with the present process. Further study of this question is needed.

33.36 : 33.52 : 09.4 (73). **Report of Committee 7-9—Post service records.** *Proc. Amer. Wood Pres. Ass.* 36, 1940 (324-30).

The service records for 1939 of test posts representing various species and treatments are tabulated.

33.36 : 33.52 : 12.2. AMADON, C. H. **Lodgepole Pine poles—full length treatment under pressure—butt treatment in open tanks.** *Proc. Amer. Wood Pres. Ass.* 36, 1940 (179-86). [Bell Telephone Laboratories, Inc., New York.]

Of 4 groups of butt-treated Lodgepole Pine poles (totalling 6,018) 16.6 per cent., and of one group of similarly treated poles (totalling 759) 52 per cent. had been removed at service ages of 10-14 and 29 years respectively. The total removed in the first 4 groups is probably much larger than the number of decayed poles, while in the last group decay is known to account for 28.6 per cent., or little more than half of the total percentage removed. Of 1,305 poles pressure-treated to give retentions of 5½-8 lb. of creosote per cu. ft. of wood, none had been removed for decay at the end of 10 years. Experiments on a commercial scale were carried out in 1938-9 and a pressure-treating schedule was devised to secure: (i) penetration to 1½ in., or 85 per cent. of the sapwood thickness; (ii) a net retention of not less than 4 lb. of creosote per cu. ft.; and (iii) clean, dry poles when finished.

33.36 : 33.52 : 12.2. **American Wood-Preservers' Association Manual of Recommended Practice. 51a. Standard specification for the preservative treatment of Pacific Coast Douglas Fir poles by pressure processes.** *Proc. Amer. Wood Pres. Ass.* 36, 1940 (124-7).

33.36 : 33.52 : 09.4 (73). **Report of Committee 7-4-1—Marine piling service records.** *Proc. Amer. Wood Pres. Ass.* 36, 1940 (314-23).

Report of the 1939 inspection of piling in Southern Pacific structures on San Francisco Bay.

33.36 : 33.52 : 12.2 (77.3). GLOVER, V. L. **Use of creosoted Yellow-Pine piles and timbers in the State of Illinois.** *Proc. Amer. Wood Pres. Ass.* 36, 1940 (261-8). [Illinois Division of Highways.]

A discussion of the use of creosoted piles and guard rails for highway bridges in Illinois, mainly with reference to constructional details.

33.36 : 33.52 : 12.2. **American Wood-Preservers' Association Manual of Recommended Practice. 41b. Standard specification for the preservative treatment of Pacific Coast Douglas Fir piles by pressure processes.** *Proc. Amer. Wood Pres. Ass.* 36, 1940 (119-23).

33.37. Distillation. Manufacture of Tar

33.37-8. TILICHEEV, M. D. **The utilization of light oils from wood carbonization for motor fuel.** *Lesokhim. Prom.* 1939 (3), (32-40); *Khim. Referat. Zh.* 1939 (7), (101). [R.] *Chem. Abs.* 34 (4538). P.R.

33.38. Charcoal Manufacture. Charcoal. Use of Wood in Power-Gas Generators. Producer Gas

33.38. WALTON, A. B. **Wood gas as a source of power.** *Malay. Forester* 9, 1940 (126-9).

The use of wood-gas vehicles in Malaya should result in a saving in the cost of fuel of not less than 80 per cent. as compared with petrol, and assured supplies would be available locally instead of having to be imported. The main drawbacks to the system are the weight of the generator and fuel, the decrease in power of adapted vehicles and, temporarily, the lack

of skilled workmen to maintain the plant in proper condition. Specially built wood-gas lorries are available, and, although expensive, are as efficient as those driven by petrol. *From author's summary.*

33.38 : 01. RUEDY, R. **Wood and charcoal as fuel for vehicles (a review of recent articles).** National Research Council of Canada, Ottawa. *N.R.C. No. 847*, [reprinted ed.] 1940. pp. 24. [Research Plans and Publications Section.]

33.38 (485). LOTHIGIUS, W. En träkolningsugn i varje socken. [A charcoal kiln in every parish.] *Skogsägaren* 16, 1940 (107-10). [Sw.]

Under present Swedish conditions charcoal is to be preferred to wood as a producer fuel and kiln-burnt charcoal is generally preferred to that made in beehive piles. Kilns of the 'Trollebo' type [cf. *For. Abs.* 1 (289)] are not very expensive, and State aid is available for their establishment. A concrete example of successful kiln running is provided by the case of a Småland landowner who possessed about 125 ha. of forest, consisting mainly of young woods in need of constant thinning, and who also ran a small sawmill and a lorry. A Trollebo kiln was installed and has been run by the farmer himself at a cost in working time of about $\frac{1}{2}$ hr. per day. The processing of one charge from the green wood to packeted charcoal takes a week in all. An old threshing machine was cheaply converted into a charcoal crusher. The charcoal produced is enough to keep the farmer's lorry and two others on the road. In addition, it has become possible to make thinnings that would otherwise have been postponed for lack of a market, to cut 'scrap' stands at a profit, and to utilize the sawmill waste. The author urges that every parish should have a charcoal kiln, and that if this were done, the use of producer gas and the small charcoal industry would outlast the present crisis and become permanent.

33.38 (485). RONGE, E. W. Kolgas eller vedgas som motorbränsle för tyngre trafik. [Charcoal gas or wood gas as a motor fuel for heavier traffic.] *Skogen* 27, 1940 (211-2). [Sw.]

Advantages of wood over charcoal as a producer-gas fuel are: (i) It is readily obtained in almost all parts of Sweden. (ii) Less work is needed to prepare it for use. (iii) It is more

economical of the raw material. The annual petrol consumption of the type of heavy traffic that uses about 3 litres per Swedish mile is roughly 100 million litres: the amount of wood necessary to replace this quantity would be about 1 million cu. m. stacked measure less than the amount required to produce the same result when converted to charcoal. With the same figures as a basis, it is thought that the use of wood would effect a labour saving of at least half a million man-days per annum.

The Swedish State Commission on Producer Gas is said to have reported satisfactory results with wood fuel in Sweden; an example is quoted in which the wood consumption was 6-7 kg. per 10 km. on a trip of 72 Swedish miles with some sharp ascents and bad road conditions, and an average speed of 51 km. per hr., fully loaded, was easily maintained. It is not suggested that wood should replace charcoal but that both should be used, though if there were any question of alternatives, preference should be given to wood.

33.38 (485). Statligt aktiebolag för gengasdrift. [A State company for producer gas.] *Skogen* 27, 1940 (216-7). [Sw.]

Since the war has cut off Sweden's petrol supplies from the west an urgent need has arisen for measures to stimulate the use of substitute motor fuels, and the government is considering a proposal to set up a special producer-gas company to be run with State co-operation. The company would be known as 'Svenska Gengasaktiebolaget' and its functions would be twofold: (i) to secure the planned production of generator plant, and (ii) to distribute, purchase, and possibly prepare suitable fuel. In the first instance it would acquire the manufacturing rights of suitable kinds of generator and arrange for their manufacture, preferably by mass-production methods, to qualified firms. It is not intended, however, that the company should take over control of the existing State fund for loans for the purchase of generators by prospective users. In handling the fuel problem the company will be concerned with both charcoal and wood and possibly any other fuels that may prove suitable; its main task will be to stimulate fuel production and to ensure proper distribution. The proposed share capital is 500,000 kronor, in addition to which advance funds from the State will be necessary and a grant of 3,000,000 kr. has been suggested for this purpose.

33.38 (71.4). AUGER, H. Regard sur la petite industrie du charbon de bois. [A glance at the small industry of charcoal manufacture.] *La Forêt Québécoise* 2 (8), 1940 (29-45). [F.]

The present price situation is considered very favourable for the further development of this industry in the Province of Quebec.

33.38 : 07.7 : 72 (943). **Producer gas units.** *Qd. agric.* 7. 54 (1), 1940 (38-41). L.S.

A list is given of manufacturers whose producer units have been tested and approved by the Australian Commonwealth authorities. Prices ranging from £60 to £85 are quoted for units suitable for trucks with 30 h.p. engines. With any of the approved units 13-16 lb. of charcoal will be roughly equal to 1 gallon of petrol. Intending charcoal burners are advised to consult the Queensland Sub-Department of Forestry, which has made charcoal from 26 different species and found most of these satisfactory, though preference should be given to the heavy woods that produce dense charcoal. A simple pit method of charcoal burning is outlined, and floating the cold charcoal is recommended as a means of separating earthy matter. Portable retorts are available at prices between £30 and £100, but are not economical unless a number are worked simultaneously. Tables are given to show (i) the comparative consumption of charcoal, kerosene, and lubricating oil in farm tractors, and (ii) the comparative costs of operating tractors on charcoal or kerosene. Savings effected by the use of charcoal are estimated to vary between 5s. 5d. and 73s. 2d. per week according to cost of charcoal and number of days worked. Though the costs of operating road vehicles are harder to assess, it is stated as a rough guide that a 30-cwt. truck operating on hauls of not less than 20 miles would have to cover at least 200 miles per week before real savings were effected.

33.38 : 34.6. **Lignin briquettes for gas producers.** *Forest Chemical Industry*, Moscow 1939, No. 3: *Brennstoff- u. Wärmewirtschaft*, Halle 22 (1), 1940 (15). Fuel. Res. Summ. 1940 (671). P.R.

33.38 : 34.6 (410). **Gas producer using factory waste for steam power and process heating.** *Steam Engineer* 9, 1940 (428-31). L.S.

A general, illustrated account is given of a

Wollaston gas producer as installed in a large English toy factory. All types of wood waste are utilized, including chips and dust from the sanding machines, as well as off-cuts. Gas from the producer is used to fire two boilers estimated to develop 15,000 lb. of steam at full load. Two coal-fired boilers in the factory are kept in reserve and used only when the heating demand is high; otherwise the gas-fired boilers carry the main load, the steam raised not only supplying about 300 h.p. per hr., but also providing all the steam required for process work and factory heating. Some general details are given on the lay-out of the power and heating system.

33.38 : 35 : 12.2 (74.6). REINEKE, L. H., and BRATTON, A. W. **Producer gas as an outlet for low-grade hardwoods.** *Tech. Note Ntheast. For. Exp. Sta.* No. 36, 1940. pp. 2.

It was found that the use of wood gas for the generation of heat and electricity was uneconomical, mainly owing to large initial investment which was necessitated by unusually high peak-load requirements.

33.39. Manufacture of Sugar, Oils, Alcohol, and Vinegar from Wood

33.39. GIORDANI, P., and LEONE, P. **Saccharification of cellulose for obtaining from wood substances sugar solutions adapted to produce industrial alcohol.** *British Patent* 523,190, 15.3.39; Italy 16.3 and 26.12.38. B.C.P.A. 1940, B (695). P.R.

33.39 : 34.26. DEREVYAGIN, A. A., and VOLODUTSKAYA, Z. M. **The composition of the fractions of common wood alcohol.** *Lesokhim. Prom.* 1939 (1), (35-40); *Khim. Referat. Zh.* 1939 (7), (121-2). [R.] Chem. Abs. 34 (4888-9). P.R.

33.4. Converted Structural Timber

33.4. I-balkar av trä. [Wooden I-girders.] *Skogen* 27, 1940 (201). [Sw.]

The HSB timber house factories have begun to manufacture wooden I-girders, known as 'HB girders' (HB-balkar), which are available in any length that can conveniently be transported. The vertical centre-piece is built up of two boards, commonly 1 in. thick, which cross each other at right angles and lie at 45° to the longitudinal axis of the girder; the cross-pieces, unlike those of iron girders, are thickest

vertically and are made of 2-in. wooden rails or of 3 or more glued laminae. The elements are held together chiefly by nailing from both sides with wire nails that are shorter than the total thickness, so that no clenching is required. The junction of centre- and cross-pieces, however, is both nailed and glued. Iron girders 24 and 30 cm. high weigh 36 and 54 kg. per metre length, respectively; wooden girders of corresponding strength are 60 and 90 cm. high and weigh 37 and 46 kg. per metre length, respectively. Tests have shown that the wooden girders can compete with iron ones in stiffness. Their chief use has so far been in the construction of roof trusses.

33.4 : 33.0 : 12.2 (944). **New South Wales timbers for building purposes.** *Pamphl. N.S.W. For. Comm. Div. Wood Tech. No. 6, 1940. pp. 8.*

The most important timbers are listed alphabetically for each of the various building purposes, in each case being subdivided into 'principal timbers' or those usually readily available on the Sydney market, and 'other suitable timbers'.

33.4 : 38 (91). BARNARD, R. C. **An experimental timber house.** *Malay. Forester 9, 1940 (110-5).*

Thirteen species of Malayan secondary hardwoods were used in identical positions in the house to test their behaviour. Shingles of *Koompassia excelsa* were used for the roof. The principal features of design are described and illustrated. The timber was seasoned before use, the foundations were constructed to give protection against subterranean termites, and precautions were taken to give adequate ventilation and protection against damp.

33.5. Roughly Converted Wood

33.51. Pitprops and Sleepers

33.51 : 2 : 12.2 (68). STEPHENS, R. P. **Mining timber in South Africa with special reference to Wattle silviculture.** *J. S. Afr. For. Ass. No. 4, 1940 (55-74).*

An analysis of the mining-timber industry from the growers' viewpoint. Consumption and production in size classes are indicated as well as the relative percentages used in the round and manufactured. It is concluded that Wattle growers should aim at larger mean diameters so as to spread production over a greater range of size classes than is covered at

present. This may produce a slight deficiency in the future demand of one or two of the smaller size classes, but due to the fact that a large percentage is manufactured, these deficiencies may be made up from surplus production in the larger size class. Recent trends in Wattle silviculture are discussed from this point of view and the salient features of current recommendations are indicated. *From author's summary.*

33.51 : 35 (73). **Review of cross-tie specifications revised to October 15, 1939.** Northern Rocky Mt. Forest & Range Experiment Station, Missoula. pp. 6.

33.51 : 35 (73). **Supplement to cross-tie specifications and prices issued October 15, 1939.** Northern Rocky Mt. Forest & Range Experiment Station, Missoula. Dec. 6, 1939. p. 1.

33.51 : 35 (73). **Review of cross-tie specifications April 15, 1940.** Northern Rocky Mt. Forest & Range Experiment Station, Missoula. pp. 7.

33.7. Firewood [Converted]

33.7 : 07.7 (485). Norrahammars vedeldningsanordning. [The Norrahammar converter for wood firing.] *Skogsägaren 16, 1940 (123-6).* [Sw.]

An appliance is described for converting coke-fired central-heating boilers to wood firing. It consists essentially of a thermostatically controlled fan that regulates the draught, alternately producing a lively fire and cutting off all air supplies when the desired temperature is reached. The appliance is manufactured by Norrahammars Bruk, Norrahammar, Sweden.

33.7 : 33.11 : 07.7. Maskinell vedhuggning. [Mechanical conversion of fuelwood.] *Skogen 27, 1940 (268).* [Sw.]

A new type of cleaving machine for fuelwood has recently been devised and tested. Cleaving is done by a circular knife blade mounted excentrically on a rotating axle, so that the knife edge exerts a combined cutting and chopping action. The machine is intended to work in conjunction with a cross-cut saw set at a higher level, from which the billets, cut into lengths of 1 m., roll down of their own accord to the intake of the cleaver, where they are gripped by a chain feeder. A heavy roller is placed in front of the knife blade to prevent

crooked billets from kicking up as they meet the blade. If the billets vary much in diameter, the feeding bed can be raised or lowered by a pedal which actuates the mechanism by means of a hydraulic oil pump. With a feed rate of 40 m. per min. and an average billet diameter of 5 in. the out-turn is 25 cu. m. solid measure per hr., or 200 cu. m. per 8-hr. day. The knife makes about 150 r.p.m., thus each billet receives 3 strokes; the blade is mounted 75 mm. out of centre, and with a diameter of 70 cm. and a centre thickness of 10 cm. it is powerful enough to cleave coarse, gnarled or knotty billets. A large flywheel is mounted on the knife spindle. The power required is about 10 h.p.

A second machine has been constructed to carry cleaving a stage farther for producer fuel-wood. In this the smaller clefts that leave the first machine are split once more by a similar cleaving knife, while the larger ones meet a double knife that splits them into three. The two knives, single and double, work in parallel and are estimated to give the same working capacity as that of the first machine.

For cross-cutting the finely cleft wood to a length suitable for producer fuel a third machine is used that has several sawblades mounted at intervals of 8 cm. on a common spindle. To avoid strain upon the blades when cutting crooked or other difficult billets a special feed mechanism is employed, consisting of spring arms mounted on a rotating spindle and aligned to pass between the sawblades, thus allowing for some give when the blades stick or meet greater resistance. The spindle and sawblades can be removed as a unit, and a fresh unit inserted, which saves considerable time in sharpening. With the feed working at 5 r.p.m. the capacity is estimated to be as much as 8 cu. m. solid measure per hour.

33.8. Other Manufactured Products

33.8 : 22.0 : 12.2 **Wood for archery.** U.S.D.A. Forest Service, Division of Forest Products, Washington, D.C. 1939. pp. 11.

34. MINOR FOREST PRODUCTS AND THEIR UTILIZATION

34.2. Vegetable Products

34.21. Forest Pasture and Litter

34.21 : 12.2. SHEPARD, A. L. **Another use for Pine needles.** *Sth. For. Notes* No. 34, 1940 (3).

Longleaf Pine needles cut into uniform lengths and disinfected are used as litter in poultry houses and later allowed to decompose to form a useful fertilizer.

34.24. Tanning Material. Cork. Dye-stuffs

34.24. MĂLAESCU, A. **Fabricarea extractelor tanante din coajă. [Production of tan-stuffs from bark.]** *Rev. Pădurilor* 52, 1940 (451-7). [Rum.f.]

A description of local barking technique.

34.24 : 12.2. ISII, M., and OSIMA, Y. **Nature of tannin of *Acacia confusa* Merrill. I. Tannin and catechin.** *J. agric. chem. Soc. Japan* 16, 1940 (476-8). B.C.P.A. 1940, AIII (778). P.R.

The bark contains a phlobaphen-producing tannin and *d*-catechin and *l*-epicatechin.

34.24 : 12.2. PRAVDIN, L. F., and YAKIMOV, P. A. **The Sallow (*Salix caprea* L.), a valuable technical plant.** *Sovetsk. Bot.* 1940 (1), (58-62). [R.] L.S.

S. caprea occurs in considerable quantities in Central Russia in secondary stands following the clear-cutting of Spruce. The tree grows very fast and its bark contains up to 20 per cent. of tannic substances, some 50 per cent. of which are of high quality, while the wood is considered particularly suitable for pulp.

34.25. Ornamental Trees. Medicinal and Edible Plants

34.25 : 12.11 : 12.2. PECHNIKOVA, S. S. **Vitamin C in European Walnut.** *Priroda Akad. Nauk S.S.S.R.* 1940 (3), (71-2). [R.] C.G.B.

Note on A. K. Gergelezhii's recent research in Moldavia, in which it was shown that nuts of *Juglans regia* accumulate vitamin C during the first 20 days of their development until the C-content of the kernel reaches 3.036 per cent. in terms of weight, which is about 40-50 times more than the corresponding figure for *Citrus* fruit. During the subsequent process of maturing, the nut gradually loses its C-content. Commercial methods are now available for preparing jams and syrups from immature walnuts with only a small loss of the vitamin.

34.25 : 45.3. TATTERSFIELD, F., MARTIN, J. T., and HOWES, F. N. **Some fish-poison plants and their insecticidal properties.** *Kew Bull.* 1940 (169-80). [Rothamsted Exp. Sta., Harpenden, Herts.]

An account is given of a number of fish-poison plants, the most interesting of which from an insecticidal point of view are a vine from the British Solomon Islands, indistinguishable from *Derris trifoliata*, *Dolichos pseudopachyrrhizus* from Kenya, *Millettia pachycarpa* from India, *Tephrosia macropoda* from Natal, and *T. vogelii* from Uganda. None of these is of the same order of effectiveness as *Derris elliptica*, but it is possible that they might find a local use.

34.26. Resin. Gums. Oils.

Turpentine. Latex. Caoutchouc.

Gutta-percha. Sugar. Alcohol

34.26 (498). Problemele zilei: rășina. [**Topical problems: resin tapping.**] [Symposium of articles by four authors.] *Rev. Pădurilor* 52, 1940 (364-80). [Rum.f.]

While the quality of the timber of Rumanian Pine is satisfactory, the quantity of resin produced is relatively small, and it is therefore essential to evolve a method of tapping that will not interfere with timber production. For this reason the tapping will have to take place within one season of felling. The total Pine area of Rumania amounts to only about 15,000 ha., and most of it is in small and scattered woodlots. It is therefore suggested that alternative species such as Juniper should be investigated for tapping.

34.26 : 12.2 (54.87). **Jak tree resin from Ceylon.** *Bull. Imp. Inst., Lond.* 38, 1940 (294-7).

The fractions obtained from a careful examination of Jak tree (*Artocarpus integer*) resin are recorded, those soluble in acetone totalling 93.9 per cent. of the sample, Caoutchouc-like material 2.9 per cent., and residual material 3.2 per cent.

34.26 : 12.2 (54.87). **Hal resin from Ceylon.** *Bull. Imp. Inst., Lond.* 38, 1940 (289-94).

Tests of samples of Hal (*Vateria copallifera*) resin indicate that it has properties similar to a damar resin though it is of inferior solubility. It is concluded that Hal resin could be marketed in Great Britain if properly graded.

34.26 : 12.2 (66.9). **Acacia laeta gum from Nigeria.** *Bull. Imp. Inst., Lond.* 38, 1940 (297-9).

An examination of a sample of the gum showed it to be inferior in quality to *A. senegal*

gum, being less soluble and forming gelatinous mucilages with comparatively weak solutions.

34.26 : 12.2. DEASY, G. F. **Tung oil production and trade.** *Econ. Geogr.* 16, 1940 (260-74). *Pl. Sci. Lit.* 12 (4), (4).

34.26 : 12.2. GARRETT, H. **Science seeks improved Tung tree. Preliminary report on value of chip budding.** *Florida Grow.* 48 (9), 1940 (13). *Pl. Sci. Lit.* 12 (11), (8).

34.26 : 12.2. POTTER, G. F., ANGELO, E., PAINTER, J. H., and BROWN, R. T. **A statistical study of variation in Tung fruits.** *Proc. Amer. Soc. hort. Sci.* 37, [1939], 1940 (515-7). *Pl. Sci. Lit.* 12 (3), (10).

34.26 : 12.11 : 12.15 : 12.2. DICKEY, R. D., and REUTHER, W. **Flowering, fruiting, yield and growth habits of Tung Trees.** *Bull. Fla. agric. Exp. Sta.* No. 343, 1940 (1-28). *Biol. Abs.* 114 (11095).

34.26 : 2 : 12.2 (69.9). WEBSTER, C. C. **Notes on the cultivation of Tung Oil trees.** *Nyasald. Tea Ass. quart. J.* 4 (3), 1940 (16-20). *Pl. Sci. Lit.* 11 (26), (13).

34.26 : 12.11 : 12.2 (94). SMITH-WHITE, S. **Studies on the Tung Oil Tree (*Aleurites fordii* Hemsl.).** *J. roy. Soc. N.S.W.* 74, 1940 (42-73). Repr. [Technological Museum, Sydney.]

34.26 : 12.12 : 44.3 : 12.2 (68.9). FORBES, A. P. S. **Some Tung Oil diseases in Nyasaland.** *Nyasald. Tea Ass. quart. J.* 4 (4), 1940 (6-10). *R.A.M.* 19 (625-6).

34.26 : 12.2 (94). PENFOLD, A. R., and MORRISON, F. R. **Tung oil (Chinese wood oil) from Australian grown trees of *Aleurites fordii* (Hemsl.), with a note on *A. montana*.** *Bull. tech. Mus., Sydney* No. 12 (4th ed.) 1940. pp. 34. [Technological Museum, Sydney.]

34.26 : 21 : 23-4 : 72 : 12.2 (91.4). SULIT, C., and TABAT, E. **Lumbang as a plantation crop in the Philippines.** *Philipp. J. For.* 3, 1940 (89-113). [Bureau of Forestry, Philippines.]

The range and distribution of *Aleurites moluccana* is given together with a description of the tree and its silvicultural characteristics. Notes are included on various aspects of the management of this species in plantations, as

well as on the collection and preparation of the nuts, manufacture of, and uses and markets for the oil, the approximate yield of oil per tree and per hectare, and financial considerations.

34.26 : 34.25 : 31 : 21 : 23 : 12.2 (63 : 67.7). CALVINO, M. Una meliacea oleifera dell' Impero. [An oleiferous Meliaceous tree of the Italian Empire.] *L'Italia Agricola* 76, 1939 (305-11). [It.] L.S.

A summary of the writings by a number of authors on the botanical characters, edaphic and climatic requirements, multiplication, oil production, timber, and the properties of the oil of *Trichilia emetica* Vahl. The notes reflect in the main the experience gained in Portuguese East Africa, which exports considerable quantities of seed of this species. Large-scale cultivation in Italian East Africa of *T. emetica*, which tolerates long drought periods and adapts itself to a great variety of soils, appears feasible and very desirable in view of the insufficient oil production of the Italian Empire. But before this is done, certain characters of the tree require more thorough investigation. Thus it is still suspected that seed from which oil has been extracted contains a poisonous substance which makes it unsuitable for the feeding of cattle.

34.26 : 12.2 (485). SANDERMANN, W. Swedish Pine-needle oil and its components. *Seifensieder-Ztg.* 66, 1939 (803, 833-4, 863-4); 67, 1940 (15-6, 45). [G.] Chem. Abs. 34 (2532). P.R.

34.26. SOLIVA, R. L'évolution de la culture du caoutchouc de 1928 à 1938. [The evolution of Rubber growing from 1928 to 1938.] *Bull. écon. Indochine* 43, 1940 (397-432). [F.] Pl. Sci. Lit. 12 (10), (5).

34.26. SMITH, E. H. G. Chicle, jelutong and allied materials. *Bull. Imp. Inst.*, Lond. 38, 1940 (299-320).

Available information is given on the botany, distribution, collection, preparation, production, marketing, and composition of the two most important bases of chewing gum—chicle (coagulated latex of *Achras sapota*) and jelutong (coagulated latex of trees of *Dyera* spp.). A note is included on other chicle-like materials.

34.26 : 12.2 (66.9). BRAND, F. T. The history of the Niger Gutta industry. *Niger. For.* 1, 1940 (25-8).

Shipments during 1937-9 of Niger Gutta

(naturally coagulated latex of *Ficus platyphylla*) to the U.S.A., where it was used in chewing gum manufacture, were followed by a collapse of the market when it was found that the gum contained some undesirable property. Sales have therefore reverted to the small annual tonnage which has characterized exports ever since Niger Gutta was displaced by Para Rubber.

34.26 : 33.32 : 34.6 : 12.2 (47.1). PYHÄLÄ, E. Rubber-resin in our native Pines. *Finsk Papp Tidsskr.* 21, 1939 (846-8). [Fi.] L.S.

Fat constituents are present in Pine in at least as large amounts as resin, and the industrial utilization of these fats by the refinement of crude sulphate lye began some twenty-five years ago. During recent investigations on the nature of impurities which prevented cheap and effective bleaching of this lye, a dark, liquid soap was precipitated following the removal of other impurities. From the soap solution thus obtained a dark, springy, ball-shaped mass was produced by polymerization. This material had a high degree of resilience and much of the qualities and appearance of rubber. A piece placed in benzine swelled perceptibly and was subsequently soft, but did not disintegrate like rubber, nor was it as sticky as rubber, and after a short period it dried into its elastic form. The rubber-resin yield was 1.2 per cent. of the raw sulphate lye, or 0.84 kg. per ton of sulphate cellulose.

34.26 : 12.2. BOIS, E., and DUGAL, L. C. Maple sap and its pH. *Nat. canad.* 67, 1940 (137-41). B.C.P.A. 1940, B (694). P.R.

Fresh Maple sap may have a pH of 6.0-7.3, according to seasonal and other conditions. It contains CO₂, most of which can be removed by a current of air, while some can be expelled only by boiling, the pH of sap so treated rising to about 9.0. Continued boiling may again reduce the pH to below its original value.

34.26 : 12.2. FUKUYAMA, G., and HANZAWA, M. On Maple sap (pt. I). *Res. Bull. Coll. exp. For. Hokkaido Univ.* 11 (2), 1940 (105-55). [Jap.]

34.27. Seeds. Fruits. Fibres and Flosses

34.27 : 12.2 (91.4). MENDOZA, D. R., and GERMISE, F. D. Survey of plants in the Makiling National Park producing edible

fruits. *Philipp. J. For.* 3 (1), 1940 (115-33). [University of the Philippines.]

34.27 : 23.24.1 : 23.26.2 : 12.2 (91.4). PACUM-BABA, P. O. **Comparative studies on the planting of budded and seedling Kapok (*Ceiba pentandra*)**. *Philipp. Agric.* 28, 1939-40 (816-28). L.S.

Sowing in the nursery gave better germination than sowing at stake. Seedlings were more vigorous than transplants when planted out. Seedlings planted directly in the field gave a high percentage, and budded plants a low percentage of success, and unbudded plants grew better and produced more leaves than budded stock.

34.27 : 12.2. LOOCK, E. E. M. **The Carob or Locust Tree (*Ceratonia siliqua* L.)**. *J. S. Afr. For. Ass.* No. 4, 1940 (78-80).

The Carob tree is indigenous to Syria and probably the northern coasts of Africa. It is a polygamo-trioecious tree, evergreen, long-lived and may grow to 50 ft. or more in height. Its fruits are flat pods 6 to 12 in. long, which when ripe form a highly nutritious and fattening food for stock. Optimum conditions for this tree are a deep porous, well drained soil and a warm climate, although it will grow on almost any soil not too wet and after a few years can survive temperatures down to 20° F. The seed has a hard coat and should be treated with boiling water before sowing. Transplanting is injurious to the long tap root and propagation should be by sowing *in situ* or by first raising the plants in one-gallon tins, and then transferring them to a planting site with original soil intact.

34.27 : 11.6 : 12.2 (56.9). SCHWARTZMAN, M. **The Pistachio Tree and its importance for the conservation of soils against erosion and for consolidation of farming in Palestine**. *Hassadeh* 20 (4), 1940 (175-7). [Heb.] *Soil Conserv. Lit.* 4 (107).

34.3. Products of the Animal Kingdom

34.3 : 13.1 (74). KULASH, W. M. **Insects of the forest floor available as food for game animals**. *J. For.* 38, 1940 (554-7). [Massachusetts State College.]

In this study samples were examined from the forest floors of six forest types. The following table summarizes the results.

Forest floor types	Total No. of insects and spiders in all samples	Estimated acre population of insects and spiders excluding the relatively small Collembola, Corrodentia, Thysanoptera
Mixed hardwood	7,493	2,548,260
Larch	6,403	812,572
Alderbottom	13,423	4,939,704
White Pine/hardwoods	6,071	2,639,736
Hemlock/Pine	16,574	2,517,768
Hardwoods/softwoods	8,853	2,034,252

It will be noted that the Alderbottom forest floor produced the greatest number of the larger insects and spiders commonly utilized by insect-eating game animals, and that while the Hemlock/Pine type produced the largest total number of insects it is in fourth place in respect to those suitable for use by game animals.

34.6. Utilization of Milling and Logging Waste

34.6. **Briquetting of wood waste**. Forest Products Laboratory, Madison, Wis. No. R842, 1939. pp. 5.

A general statement on wood-waste briquetting and the conditions required for successful manufacture and sale of briquettes.

34.6. DARLING, C. S. **Utilization of waste wood for power and steam generation**. *Steam Engineer* 9, 1940 (390-2). L.S.

A popular article on the advantages of using waste wood as fuel in woodworking factories. Besides the economy resulting from the use of a waste fuel produced on the spot, the problem of refuse disposal is solved and the cleaner condition of machines and workshops produces greater all-round efficiency. Brief notes are included on a type of boiler specially designed to run on wood waste of all kinds.

34.6. FREY, U. **Manufacture from ground wood of material suitable for floors and walls**. *British Patent* 521,404, 15.11.38: Switz., 18.11.37. B.C.P.A. 1940, B (671). P.R.

Finely ground waste wood (1 l.) is impregnated with paraffin (100-200 g.) and then kneaded with a solution of casein glue (300 c.c.; 50 per cent. sol.), optional additions being kaolin (100-200 g.) and rubber latex (600 c.c.).

34.6 : 07.7. **Wood refuse destructor.** *Engineering & Boiler House Review* 54, 1940 (102). L.S.

A brief description by the manufacturers, Fisher Deane Engineering Co. Ltd., London, of an incinerator plant designed to burn shavings and other wood waste, including sawdust, also flax shives, cotton-seed husks, and similar materials. The plant is already available in standard sizes to handle $\frac{1}{2}$, 1, or $1\frac{1}{2}$ tons per hr., and is also being produced in smaller sizes to meet special requirements.

34.6 : 07.7. GRAHAM, F. O. **Apparatus for forming fuel briquets of sawdust.** U.S. Patent No. 2,194,593, Mar. 26, 1940. Chem. Abs. 34 (4889). P.R.

Various structural, mechanical and operative details.

34.6 : 33.11 : 07.7. **Magnetic device keeps metal out of hog.** *Timberman* 41 (11), 1940 (12).

Sensitive magnets placed under the conveyor belt set up electrical disturbances when metal objects fall on the belt and by means of radio pick-up and amplification the current driving the belt is cut and a warning light is flashed.

34.6 : 33.32 : 07.7. HULSART, C. A. **Bark burning furnaces for the pulp and paper industries.** *Paper Tr.* 7. 111 (9), 1940 (65-71). [Babcock & Wilcox Co., New York.] P.R.

Waste-wood fuel is now practically on a par with other fuels, and steam generating equipment is available for using this fuel either by itself, or in combination with coal, gas, or oil, for any capacity, pressure, and temperature. There are so many variables in even one particular kind of wood refuse fuel that performance predictions for such equipment can be made only on the basis of representative samples of the fuel. Consideration has been given to the possibility of drying wet wood fuels by utilizing the stack gases. A detail study of the money value of the B.t.u.'s available in the flue gases of modern equipment indicates that there is very little margin of profit available. *From author's summary.*

34.6 : 34.26 : 12.2 (45). BOTTINI, O. Sulla utilizzazione delle ceppaie di pino silano. [On the utilization of Pine stumps on the Sila plateau.] *La Ricerca Scientifica*, Rome 10, 1939 (856-65). [It.] L.S.

Prospects of developing the Italian resin industry are discussed. The large quantity of

Pine stump wood available in Sicily is considered the most promising source of raw material. This view is substantiated by analytical data from Sicilian specimens showing (1) the water, resin, colophony, and turpentine content of the wood as affected by age of tree and the length of time during which the stump remained in the soil, (2) the colophony/turpentine composition of the resin, and (3) the characteristic properties of the colophony.

35. SALE AND DISPOSAL OF FOREST PRODUCTS

35 (73). **Marketing forestry products. Excerpts from 1939 annual reports of State and County Extension Agents.** Extension Service & Forest Service, U.S. Department of Agriculture, Washington, D.C. 1940 [?]. pp. 19.

35 : 01. **Co-operative marketing of forest products: a bibliography.** U.S.D.A. Forest Service, Washington, D.C. 1939. pp. 22.

35 : 06 (73). **Report on inter-Experiment Station log grading conference, Feather River Branch Station & Blacks Mountain Experimental Forest, Nov. 27-29, 1939.** California Forest & Range Experiment Station, Berkeley, Calif. pp. 26.

35 : 12.2 (73). **1939 standard specifications for southern Pine lumber.** Southern Pine Association, New Orleans. 1939. pp. 116.

35 : 12.2 (73). **Standard grading rules for Northern White Pine (*Pinus strobus*—northeastern type) and Norway Pine (*Pinus resinosa*—northeastern type).** Northeastern Lumber Manufacturers Association, Inc., New York. 1937. pp. 20.

35 : 12.2 (73). **Grade-marking of northeastern softwoods. Grade-use recommendations for northeastern softwoods. Grade recommendations for Northern White Pine and Eastern Spruce.** Northeastern Lumber Manufacturers Association, Inc., New York. 1939. pp. 8.

35 : 12.2 (73 : 71). **Standard grading rules for Eastern Spruce and Balsam Fir.** Northeastern Lumber Manufacturers Association, Inc., New York. 1938. pp. 18.

Also officially adopted by Canadian Lumbermen's Association, Ottawa, Ont., for Eastern Canadian Spruce lumber exported to the United States.

35 : 32.3 : 12.2 (75 : 76). **Recommendations for classification of southern Pine logs.** *Southern Pine Forestry Notes* No. 71, 1940. p. 1. [Southern Pine Association.]

35 : 33.1 (485). WEJDMARK, P. Sorteringsregler för sågat virke. [Grading rules for sawn timber.] *Skogen* 27, 1940 (267). [Sw.]

A plea is made for the introduction of officially recognized standard grading rules for sawn timber in Sweden. Such rules as exist are out of date and lack authority.

35 : 6 : 97.2 (77.7). RAMSEY, G. R. **Co-operative woodland management and marketing in southeastern Iowa.** *Ames For.* 28, 1940 (47-52).

The plan advocated for organizing co-operative woodland management and marketing among the farmers of this region is briefly as follows:—Each member would pay a membership fee in advance, and upon instructions from the board of directors, composed of members of the co-operative, would lend any amount up to the maximum established by the association for furthering the work of the latter. Such loans would draw interest and be repaid from a special fund created by charging for the services rendered by the association. The co-operative would employ a full-time forester and a field man for full or part time as the occasion demanded. The members of the co-operative would be required to (1) protect woods from fire, (2) eliminate grazing from the woods, (3) cut only timber that has been marked by the forester of the co-operative, (4) deliver all harvested material, except that marked for home use, to the co-operative, to be marketed by the latter, (5) follow the management practices recommended by the co-operative, and (6) co-operate in wild-life preservation. There are some 349,000 acres of farm woodland in the eight southeastern counties of Iowa which could benefit from the type of co-operative described. It is thought that considerable assistance from outside sources, including the wood-using industries, could be secured for the co-operative plan.

37. FOREST TRANSPORT

37 : 38. KON, T. **On the strength of the holding boom in drifting (I).** *Res. Bull. Coll. exp. For. Hokkaido Univ.* 11 (2), 1940 (19-104). [Jap.e.]

Section 1 is concerned with the theory of the calculation of the structural stresses in the main and auxiliary wire rope systems.

38. FOREST CONSTRUCTIONAL WORKS. FOREST ENGINEERING

38 : 07.7. CALLIN, G. Lättransportabla bergbormaskiner i skogsbrukets tjänst. [Portable rock drills for forestry purposes.] *Skogen* 27, 1940 (250-1). [Sw.]

Some details are given of the cost of a portable outfit comprising an Atlas Diesel HF-4D compressor plant, a CH-5 rock drill, and various accessories. The equipment has been successfully employed for forest roadbuilding and sinking wells in rocky ground in the Örebro district. It is possible to use compressor plants for driving other engineering appliances. Brief notice is also given to the Warsop drill, which is of the familiar type with motor and drill as a single unit.

38 : 33.36. HARRISON, J. L. **Road bridge decking.** *Indian For.* 66, 1940 (476-9).

A discussion of types of decking for timber road bridges with particular reference to American practice. Two types of decking that have been used in America are described and illustrated. In the simpler of these 4 in. decking is laid transversely on road bearers, nailed firmly in place, covered with a heavy coat of hot asphalt, and, while this is still plastic, a second layer of decking, 2 in. thick, is laid on top longitudinally and nailed in place. A layer of asphaltic cement on the inside of the wheel guards prevents seepage.

38 : 33.4 (73). MYER, J. E. **What connectors have done in the South for the handling of lumber in a fabricated form.** *Sth. Lumberm.* 159 (2009), 1939 (169-72).

Since 1933 over 18,000 structures in 44 States have been built with the aid of timber connectors, requiring over 562 million bd. ft. of timber valued at more than 11 million dollars. Well over half of this quantity came from the southern United States. Some typical examples are given of large buildings in the southern States in which connectors have been used.

38 : 33.5. MILLER, T. A. H. **The use of logs and poles in farm construction.** *Fmrs'. Bull. U.S. Dep. Agric.* No. 1660 [revised ed.,

1935; reprinted] 1939. pp. 26. [Bureau of Agricultural Engineering.]

38 : 33.52. KELLEY, M. A. R. **Farm fences.** *Fmrs'. Bull. U.S. Dep. Agric.* No. 1832, 1940. pp. 57. [Bureau of Agricultural Chemistry & Engineering.]

4. PROTECTION

42. PROTECTION AGAINST INJURIES FROM INORGANIC AGENCIES

42.2. *Temperature Influences*

42.2 : 11.11 : 23.24.1 : 23.24.2-3 (77.4). DETERS, M. E. **Frost heaving of forest planting stock at the Kellogg reforestation tract, near Battle Creek, Michigan.** *Pap. Mich. Acad. Sci.* 25, 1939 [issued 1940], (171-7). [Michigan State College.] L.S.

Frost heaving was most severe on a valley site with loam soil, slow surface drainage, and high water table. Seedling or small, weak stock heaved more than transplant or large stock. Mulching with straw or sod was markedly effective in reducing heaving damage. Almost no injury was suffered by 1937 fall plantings made under the following conditions: (1) furrows ploughed in an east-west direction; (2) furrows narrow, 5-6 in. deep; (3) trees planted close to the south wall of the furrow; (4) soil packed firmly around roots; (5) soil mounded slightly around base of trees; and (6) north side of tree mulched with sod from which the soil had been shaken. *From author's summary.*

43. FOREST FIRES

43-5 : 33.32 (71). SHAW, E. E. **The pulp and paper industry's approach to forest protection in Canada.** *Pulp Paper Mag. Can.* 41, 1940 (675-8). [Canadian International Paper Co.]

Emphasis is placed on the industry's readiness to co-operate in protective measures and on the need of intensified insect control.

43 (73). HEADLEY, R. [Editor]. **Extracts from reports on larger fires of 1939 in western regions.** U.S.D.A. Forest Service, Washington, D.C. 1940. pp. 33. [U.S. Forest Service.]

43 : 72 (71.1 : 78.6 : 79.6). GISBORNE, H. T. **Comparison of intensive versus limited**

forest fire control action. *Res. Note Nth. Rocky Mt. For. & Range Exp. Sta.* No. 10, 1940. pp. 5.

The main headings for the material contained in this bulletin are: kinds of fences, fence posts, life of fences, cost of fencing, construction methods, lightning protection, gates and entrances, and maintenance of fences.

During the lightning-storm period of 1940 fire damage in the Kaniksu and Kootenai National Forests, where intensive control had been practised, was so much smaller than in comparable adjacent woods in Canada with only limited control, that the extra cost of intensive control has proved to be very profitable.

43.1. *Protective Measures*

43.1. KING, H., and DAVIES, A. **Parachute jumping in forest fire control: report of field experiments, fall 1939.** Region 6, Forest Service, U.S. Department of Agriculture, Portland, Oregon. 1939. pp. 71 + 11.

43.1. SUTLIFF, C. B. **Co-ordinating fire control plans.** *J. For.* 38, 1940 (627-9). [U.S. Forest Service.]

A critical discussion of the lack of co-ordination among the various forest protective services in collecting and applying the data fundamental to a sound interregional forest fire-control plan. It is emphasized that the basic studies from which a fire-control plan may be developed must be representative, and furnish accurate information. Reference is made to a paper by W. G. Morris [cf. *For. Abs.* 1 (293)].

43.1 (77.4). **Forest fire fighting in Michigan.** Michigan Department of Conservation. pp. 58.

The pamphlet discusses briefly the objectives and policies of the Michigan Department of Conservation regarding forest fire control.

43.1 : 07.7. HEWSON, D. T. **Performance rating tests of plain forest fire nozzles and fire nozzles of special form.** *Rep. nat. Res. Coun. Can.* No. PFN-2, 1938. pp. 26. [National Research Laboratories, Canada.]

Data on the discharge characteristics of plain

nozzles ranging in size from $\frac{1}{8}$ in. to $\frac{1}{2}$ in., and of several nozzles of special form. Results of the tests indicate that the performance and effectiveness of the nozzles of special form that were tested are little, if any, better than those of the nozzles in general use, while the greater weight of the special nozzles is a serious handicap in forest use.

43.1 : 07.7. HEWSON, D. T. **Performance rating tests of forest fire pumping units.** *Rep. nat. Res. Coun. Can.* No. PFP-2, 1938. pp. 33. [National Research Laboratories, Canada.]

The report covers laboratory performance tests of discharge pressure, rate of discharge, and engine speed for 5 different units.

43.1 : 07.7. HEWSON, D. T., and WRIGHT, J. G. **Performance rating tests of forest fire pumping units and hose nozzles.** *Rep. nat. Res. Coun. Can.* No. PFP-3, 1939. pp. 43. [National Research Laboratories, and Dominion Forest Service, Canada.]

43.1 : 07.7. HEWSON, D. T. **Forest fire hose.** *Rep. nat. Res. Coun. Can.* No. MSH-1, 1940. pp. 41. [National Research Laboratories, Canada.]

The report deals with studies carried out to determine the friction loss in, the leakage from, the bursting strength of, and the significance of leakage as a means of protection against the burning of, $1\frac{1}{2}$ in. unlined linen forest fire hose. Data are also given on hoses of other types and sizes including a comparison of pump and nozzle performance with the use of $1\frac{1}{2}$ in. and 2 in. unlined linen hose.

43.1 : 07.7. FUNKE, F. W. **A slip-on tanker unit.** *Fire Control Notes* 4, 1940 (129-31). [Region 5, U.S. Forest Service.]

Description of a 196-gallon unit designed for easy mounting on, and dismounting from, trucks.

43.1 : 07.7. STICKEL, P. W. **A brush-breaker fire truck: the tank of forest-fire warfare.** *Fire Control Notes* 4, 1940 (142-8). [Northeastern Forest Exp. Sta.]

The truck described contains a 1,000-gallon water tank with elaborate pumping equipment and can operate along the edges of a fire regardless of lack of roads or the presence of brush and pole-size trees. The performance data presented indicate that such trucks are highly effective in dealing with fast-moving

fires, and in many instances may obviate the need for firebreak construction.

43.1 : 07.7. FUNKE, F. W. **Mobile flame thrower.** *Fire Control Notes* 4, 1940 (117-20). [Region 5, U.S. Forest Service.]

The flame thrower described was designed to provide a larger and more powerful unit than the standard portable back-pack outfit. It is to be used in difficult back-firing jobs along roads and trails. The total weight of the unit loaded is approximately 500 lb.

43.1 : 11 (71). WRIGHT, J. G. **The practical value of forest-fire hazard records and forecasts.** Dominion Forest Service, Ottawa. 1940. pp. 9.

A simple explanation of the relation of weather conditions to forest fire hazard, of the use of weather records and fire-hazard tables for computing the hazard index, and of the value of this information in planning the work of the fire protection crew and in managing forest activities. Extracts are included from published documents of organizations using the method of fire-hazard measurement developed by the Dominion Forest Service.

43.1 : 11 (71). WRIGHT, J. G., and BEALL, H. W. **Preliminary improved forest-fire hazard tables for eastern Canada** [with supplements]. *For.-Fire Res. Note* No. 5, 1940. pp. 91.

43.1 : 11 (71). BEALL, H. W. **Forecasting weather and forest-fire hazard from local observations** [revised]. *For.-Fire Res. Note* No. 10, 1940. pp. 52.

The note outlines a method by which the layman may make for himself weather predictions based on local observations, and deals with the application of such predictions as well as of data from official meteorological bulletins to the forecasting of forest-fire hazard. This is done preferably using the Wright System by which predicted weather conditions are applied directly in tables appropriate to particular forest types. Hazard forecasts for the ensuing day based on local observations and on the Wright System have been found sufficiently accurate to be of value for administrative purposes in about 9 cases out of 10. The Appendices include *inter alia* definitions of terms for use in preparing local weather forecasts and in marking forecast accuracy.

43.1 : 11.1. STOATE, T. N., and HARDING, J. H. **Calculated estimate of fire weather.** *Aust. For.* 5, 1940 (4-12).

A formula is developed giving empirical relationship of afternoon moisture content of wood cylinders at time of maximum hazard conditions to (1) an estimate of afternoon weather elements (relative humidity and temperature) based on the morning weather forecast and (2) the morning moisture content of wood cylinders, which is known. The measure of afternoon hazard is based on the estimated afternoon moisture content.

43.1 : 11.44 : 11.12 : 11.15. BYRAM, G. M. **Sun and wind and fuel moisture.** *J. For.* 38, 1940 (639-40). [Appalachian Forest Exp. Sta.]

Two test sticks, one blackened with charcoal and one white, were submitted to direct sunlight and wind current while two similar sticks were placed in calm air in the sunlight, all sticks having initial moisture contents of 60 per cent. From periodic determinations of the moisture content of these sticks it is concluded that the effects of wind and sunshine do not necessarily supplement one another in reducing fuel moisture content, but that the wind partially offsets the drying effect of the sun by lowering the surface temperature of the fuel. Also that blackened sticks absorb more sunlight than do white sticks and so have relatively lower moisture contents.

43.1 : 61. NANCE, M. N. **Devices for computing suppression coverage.** *Fire Control Notes* 4, 1940 (132-5). [Region 6, U.S. Forest Service.]

Having estimated the rate of travel in miles per hour of the average forest guard, taking into consideration the load to be carried and the nature of the ground to be covered, the distance that will be travelled along a trail in any given time can be determined relatively accurately on the map with the aid of the devices described. Compensation for trail curvature is allowed for by the second device.

43.1 : 61. STATHEM, P. **The Stathem fire-finder disc.** *Fire Control Notes* 4, 1940 (149-57). [Region 5, U.S. Forest Service.]

The tool described is a celluloid disc scaled to allow of quick and accurate fire location on the map using only one line of sight with an angle of depression of 0-20°.

43.1 : 61. COLBY, V. V. **The silk-screen stencil for printing azimuth circles.** *Fire Control Notes* 4, 1940 (158-9). [Region 3, U.S. Forest Service.]

43.1 : 82. BYRAM, G. M. **An eye test for lookout men.** *Fire Control Notes* 4, 1940 (123-8). [Appalachian Forest Exp. Sta.]

43.1 : 82 (74.2). HULETT, H. C. **Organizing natives to function as fire-fighting units using the 10- to 15-foot method.** *Fire Control Notes* 4, 1940 (101-11). [Region 7, U.S. Forest Service.]

The extensive areas of tangled heavy fuels left after the New England hurricane of September 1938 presented a fire-control problem of unusual proportions. The Forest Service of the White Mountain National Forest set about the development of a technique of line construction suited to the situation. Local crews averaging about 135 men were trained to work under the prevailing conditions while keeping to the stipulated 10- to 15-foot spacing on which the speed of line construction largely depends. Detailed time studies were made for variously organized crews, and the tests indicate that, under daylight conditions, from one-third to one-half of a chain per man-hour, in extremely heavy fuel type and duff cover, can be cleared and dug for each hour the crews are actually on the job. This includes all overhead (camp staff, &c.) normally required. It is thought that the 800-1,000 local inhabitants who were subjected to this systematic method of fire-line construction will materially strengthen the fire organization of the region for a number of years.

43.1 : 82 (79.7). TAYLOR, P. K. **Co-operative fire prevention.** *Fire Control Notes* 4, 1940 (112-4). [Region 6, U.S. Forest Service.]

Description of the successful functioning of a voluntary organization of citizen fire wardens in the Wenatchee National Forest.

43.3. Fire Damage

43.3 : 74 (74.1-7). STICKEL, P. W. **Some preliminary tables of forest-fire damage values for the Northeastern Oak Region.** *Tech. Note Ntheast. For. Exp. Sta.* No. 31, 1940. pp. 2.

44. PROTECTION AGAINST DAMAGE BY HARMFUL PLANTS

44.1. *Forest Weeds*

44.1 : 07.7. STEPHEN, W. J. **Weed eradication by chemicals.** *Circ. Ont. Dep. Agric.* No. 58, 1940. pp. 12.

Short notes are given on pulverized cyanamid dust, Atlacide, Elephant Brand ammonium sulphate, and sodium chlorate as weed killers, followed by an account of the Stephen Weed Killer, a non-patented mixture of sodium chlorate, ammonium sulphate (preferably with the addition of a small quantity of baking soda), and common salt. Directions are given for procuring and mixing the ingredients, which must not be made up in a dry form, and suitable mixtures are recommended for various types of weed growth. Suitable types of sprayers are described and notes are provided on their special care.

44.1 : 12.2 : 13.1 : 13.2 (54). BEESON, C. F. C., and CHATTERJEE, N. C. **Possibilities of control of Lantana (*Lantana aculeata* L.) by indigenous insect pests.** *Indian For. Rec. (n.s.) Entomology* 6, 1940 (41-84). [Forest Research Institute, Dehra Dun.]

Part one is a résumé of the introduction of Lantana insects to various countries, prepared for the information of forest officers in India. It is concluded that no indigenous Indian species of insect is sufficiently manageable to control Lantana by biological methods. Lines of future research are suggested. Part two deals with the biology of 54 Lantana insects investigated at Dehra Dun. An appendix summarizes the seasonal history of Lantana and the parts of the plant attacked by insects in Dehra Dun. *From authors' summary.*

44.1 : 12.2 : 97.3 (76.4). DAMERON, W. H., and SMITH, H. P. **Prickly Pear eradication and control.** *Bull. Tex. agric. Exp. Sta.* No. 575, 1939. pp. 55.

The two most effective measures for eradicating Prickly Pear on range lands in Texas are grubbing and piling, and poisoning. The best poison is 3 lb. of arsenic pentoxide in 1 gal. of water, with the addition of 1 pint of commercial sulphuric acid, the resulting liquid being applied by special equipment as a mist spray. Spraying is best done in rainless weather between June and September; if rain occurs within 24 hours the application must be repeated. A metal alloy known as 18-8-S

stainless steel is sufficiently resistant for use as sprayer tanks. Costs of grubbing and piling range from 25 cents to \$3 per acre, and those of poisoning from \$2-50 to \$3 per acre, depending in each case on the density of the Prickly Pear stand.

44.3. *Fungi*

44.3 : 01. HEUBERGER, J. W. **A laboratory biological assay of tenacity of fungicides.** *Phytopathology* 30, 1940 (840-7). [Connecticut Agricultural Exp. Sta.]

44.3 : 12.12 (52). HASEGAWA, K. **An illustrated account of plant diseases and their importance and control in forestry.** Imperial Household Forestry Experiment Station, Tokyo-Fu, Japan. 1939. pp. 11. [Jap.]

44.3 : 12.12 : 12.2 : 23.27. MARSHALL, R. P. ***Sphaeropsis* canker and dieback of shade trees.** *Proc. nat. Shade Tree Conf.* 15, 1939 (65-9). [Bureau of Plant Industry, U.S.D.A.]

Descriptions are given of the canker and dieback diseases caused by *Sphaeropsis malorum* on a wide variety of trees, *S. ulmicola* on American Elm, *S. quercina* on various Oaks, and *S. ellisii* on Austrian Pine and other conifers. In all cases horticultural control measures follow the same lines, e.g. removal of infected parts, fungicidal spraying, and attention to an adequate nutrient and water supply.

44.3 : 12.12 : 12.2 : 23.27. TEHON, L. R., and JACOBS, H. L. **Experimental injection of Hard Maple saplings artificially infected with *Verticillium albo-atrum* R. & B.** *Bull. Davey Tree Expert Co.* No. 7, 1939. pp. 31.

Trees of *Acer saccharum* readily accepted injections of some substances, but appeared to offer definite resistance to others. No correlation existed between the injuriousness of a substance and the relative ease of injection. Of the substances tried, thymol alone caused no apparent injury; brilliant green produced severe trunk injury around the point of injection and also stimulated growth of bark tissues; phenyl-mercuric nitrate killed the cambium and inner bark for some distance above and below the injection; and malachite green caused first severe burning of the foliage and eventually the death of the trees. Thymol, phenyl-mercuric nitrate, and malachite green were readily taken up, while brilliant green was resisted. Dry boric acid caused very severe trunk injury and seemed to intensify the

severity of a leaf scorch generally prevalent in the plot. A vaccine, acceptance of which was definitely resisted, caused no injury in the quantities injected, and the trees so treated were subsequently among the best appearing in the plot. Because of the slowness with which disease developed, it was impossible to establish whether any treatment delayed or hastened its development. However, the ratios of the successful recoveries of the fungus to the number of attempts to recover it in two sets of cultures from sample trees tend to indicate that, over the full period, the fungus found conditions less favourable for growth in the wood of all the treated trees. Such ratios were consistently so low for trees given thymol and vaccine injections that some detrimental action upon the parasite is attributed to these substances. *From authors' summary.*

44.3 : 12.12 : 12.2 : 23.27. HEPTING, G. H. **A vascular wilt of the Mimosa tree (*Albizia julibrissin*)**. *Circ. U.S. Dep. Agric.* No. 535, 1939. pp. 10. [Bureau of Plant Industry, U.S.D.A.]

A destructive vascular wilt of *Albizia julibrissin* has recently appeared in the south-eastern United States. Its symptoms, which are identical with those of a similar epidemic disease in Southern Russia, are wilting and death of the foliage, and a brown ring of discoloured sapwood, usually in the current annual ring of the stem and branches. Positive results have been obtained from inoculations with what seem to be two forms of a species of the *Elegans* section of *Fusarium*, isolated from the discoloured sapwood, and the commoner isolate is described as *F. perniciosum* sp. nov. No correlation has been found between the disease and site factors. The disease is a rapid killer and appears to have spread since about 1930 from Tryon, North Carolina, to a large number of widely scattered localities. Movement of soil from infected to non-infected areas should be discouraged, and planting stock should be taken from definitely non-infected areas. No practical way is known of controlling the disease when it has appeared and the trees should therefore be replaced by other species. As a precaution, wounds should be disinfected and coated, and pruning and other tools sterilized after use on infected trees.

44.3 : 12.12 : 12.2. BERG, A. **A rust-resistant Red Cedar**. *Phytopathology* 30, 1940

(876-8). [West Virginia University, Morgantown.]

Trees selected in a Red Cedar (*Juniperus virginiana*) grove for susceptibility and resistance to *Gymnosporangium juniperi-virginianae* Schw., and left in position for 16 years, maintained these characters throughout the period. Scions were taken from the most promising trees and propagated by grafting, being transferred when well established to an Apple orchard where maximum rust infection occurred practically every year. After 4 years of such exposure the scions from one tree show consistently high resistance to the fungus, and it may be assumed that under natural conditions this tree would never become severely infected with the rust prevalent in this region. Since, however, there is a possibility that the tree might not be resistant to all strains of the fungus, stock is now being propagated for distribution and testing in other regions.

44.3 : 12.12 : 12.2 : 23.26.7 (75-6). LAMB, H., and SLEETH, B. **Distribution and suggested control measures for the Southern Pine fusiform rust**. *Occ. Pap. Sth. For. Exp. Sta.* No. 91, 1940. pp. 5. [Bureau of Plant Industry, U.S.D.A.]

The rust fungus *Cronartium fusiforme* (A. & K.) Hedgec. (cf. *Occ. Pap. Sth. For. Exp. Sta.* No. 72, 1937) commonly causes spindle-shaped cankers on Southern Pines of all ages in the Gulf States, its alternate hosts being various species of Oak. Slash (*P. caribaea*) and Loblolly (*P. taeda*) Pines are the most susceptible; Longleaf Pine (*P. palustris*) is relatively resistant; and Shortleaf Pine (*P. echinata*) seems to be immune, though subject to spherical cankers caused by *Cronartium cerebrum* Hedgec. The Black Oaks are much more susceptible than the White Oaks, the affected species of the former group, in descending order of susceptibility being: *Q. nigra* and *Q. phellos*, *Q. laurifolia*, *Q. marilandica*, *Q. cinerea*, *Q. rubra*, and *Q. catesbaei*. A map is given to show the range of the fungus and the regional intensity of infection, which is most severe in the southern portions of Louisiana, Mississippi, and Alabama. In this region the Loblolly and Slash Pine stands examined had 20-50 per cent., and occasionally up to 80 per cent., of infected trees, while stands of Longleaf Pine seldom showed more than 10 per cent. infection. Nursery losses follow the same regional trend. Death from the disease is most frequent

in the seedling and sapling stages, when cankered stems are either killed or rendered worthless. Older trees with trunk cankers may live for a number of years and often seem to grow almost as well as uninfected stems, though they are more liable to wind breakage. Trunk cankers are less serious on Loblolly than on Slash Pine, and damage to the latter species is generally more severe. Branch cankers that fail to reach the trunk are believed to be practically harmless.

In nursery control work Oaks should be eradicated from the neighbourhood if possible, or at least more susceptible trees should be felled if eradication cannot be made economical by sale of the timber. Results to date indicate that nursery losses should be greatly reduced by a combination of late sowing and early, thorough spraying. Sowing should be as late as possible. Spraying should begin as soon as the seedbeds are uncovered, or when urediospores appear in the vicinity, and should continue weekly until 1st June. Where past infection has been heavy, it may be necessary to spray at least once before the burlap or other covering is removed, and twice a week for the first three weeks thereafter. A 4-4-50 Bordeaux spray is recommended, with the addition of a good sticker and spreader, the two most promising being liquid Santomerse (1 pint per 100 gals. of spray) or linseed-oil and soap emulsion (6 lb. of raw linseed-oil and 6 lb. of soap emulsified in 6 pints of water to 100 gals. of spray). Fish-oil soap or casein spreader may be used at the rate of 3 lb. per 50 gals. of spray. Dust fungicides probably give inadequate protection from the fungus. In young stands less than 10 ft. high the infected branches may be pruned before the cankers reach the trunk, all branches with cankers less than 2 ft. from the trunk being removed. As the fungus dies with the branch, it is not necessary to burn or otherwise destroy the prunings. In older stands, cankered trees should be cut out during thinnings and utilization cuttings.

45. PROTECTION AGAINST DAMAGE BY ANIMALS

45.1. *Mammals*

45.1 : 12.12 : 12.2 : 13.2 (74.4). PEARCE, J., and REINEKE, L. H. **Rabbit feeding on hardwoods.** *Tech. Note Ntheast. For. Exp. Sta.* No. 35, 1940. pp. 3.

An area of 2-year-old cuttings of six hard-

wood species was thoroughly worked over by cottontail rabbits and a marked variation is shown in the species selection. The species, in descending order of percentage of trees damaged, are: Kentucky Coffee Tree 100 per cent., Honey Locust 99.2 per cent., Hardy Catalpa 97.4 per cent., Black Locust 25.1 per cent., Hackberry 19.9 per cent., and Red Mulberry 0.0 per cent. Observations in a 21-year-old natural stand of northern hardwoods showed that the following species were particularly attractive to rabbits, listed in order of apparent preference: Serviceberry, Beech, Striped Maple, Sugar Maple, and Red Maple. Balsam Fir appears to be distasteful and Gray, Yellow, and Paper Birches were practically untouched. Nearly all gnawing was confined to trees 1 in. d.b.h. or less.

45.1 : 23.23 : 12.2 : 13.2 (47.6). SVIRIDENKO, P. A. **Rodents as a pest of Cork Oak and the rôle of silvicultural measures in their numerical control.** *Lesnoe Khozyaystvo, Moscow* 1940 (6), (57-60). [R.]

The investigations described, which were carried out in the Black Sea littoral, showed that thorough cleaning of the plantation area and repeated weeding after planting diminished considerably the percentage of acorns destroyed by mice, rats, and hares. Sowing should follow immediately on the collection of seed, when other rodent food is plentiful.

45.3. *Insects*

45.3 : 07.7. POTTER, C., and HOCKING, K. S. **An apparatus for testing and comparing the biological action of insecticides on flying insects and a method for sampling the concentration of the atomized insecticide.** *Ann. appl. Biol.* 26, 1939 (348-64). [Imperial College of Science & Technology, London.] P.R.

45.3 : 12.12. SHIELD, V. I. **An experience with dormant spray oils.** *Proc. nat. Shade Tree Conf.* 15, 1939 (196-204).

Serious injury is reported to have been caused by the use of a certain commercial dormant oil spray against leaf-rollers on shade trees, mostly Oaks and Hickories, in Missouri. Since the spraying was carried out, 93 trees have died, and 308 are injured sufficiently to necessitate pruning. It is problematical whether the nature of the spray or atmospheric factors at the time of spraying can be held responsible for the damage.

45.3 : 12.12 : 12.2 : 13.2 (71.5). BALCH, R. E., and PREBBLE, J. S. **The bronze Birch borer and its relation to the dying of Birch in New Brunswick forests.** *For. Chron.* 16, 1940 (179-201). [Dominion Entomological Laboratory, Fredericton, N.B.]

During the past five years, Yellow, White, and Grey Birch, throughout most of New Brunswick, have been dying in large numbers from the top down. In 1939 the typical mature Yellow Birch stand showed about 20 per cent. of the trees dead and 35 per cent. with over half the crown dead. Young stands were much less severely injured. Virgin stands showed almost as much damage as cut-over lands. Larvae or galleries of *Agrius anxius* were present in practically all injured branches. Some trees, however, were found with the early symptoms of weak foliage growth in the top and no borer attack. Occasional trees occurred with some dead branches and little or no borer attack. No evidence has yet been discovered of the presence of any other destructive organism likely to be the primary cause of death.

The question of the relation of the borer to the observed damage is discussed and the following conclusions are drawn: (a) The young larvae need living cambial tissue, but the development of the final stage to successful pupation is dependent on the death or the moribund condition of the part attacked. (b) Trees of almost all ages, growing normally and apparently healthy, can be attacked and the larvae can develop in them to a half-grown stage. If the attack is sufficiently heavy to bring about the dying of the branch at this stage, development may continue to the adult stage. If the attack is too light for this, galleries are healed over and normal growth is gradually resumed. Such 'unsuccessful attacks' may occur several times in a tree's history. The success of an attack depends on the vigour of the tree and the numbers of the insect. (c) Normally, the insect prefers mature or over-mature trees or trees in which some other factor than age has seriously reduced the vigour of the part attacked. Given a large supply of such material to breed in, it is capable of increasing in numbers and as a result can successfully attack greater numbers of healthy trees. (d) The injury caused by the galleries may be due chiefly to the destruction of the phloem and the resulting interference with the conduction of food materials in an upward as well as downward direction.

The following factors appear likely to have contributed to the present situation in New Brunswick: (1) The presence of large areas of mature and overmature stands. (2) The damage to Birch from exposure following cutting for softwoods and dying of softwoods from budworm attack. (3) Repeated attacks by defoliators. There is no clear evidence of climatic factors having caused direct injury. Five classes of injury are suggested as a basis for sample plot tallies to estimate the need for salvage. *From authors' summary.*

45.3 : 12.12 : 12.2 : 13.2 (68.2 : 68.5). TOOKE, F. G. C. **Investigations on the biology of *Euproctis terminalis* Walk, the Pine brown tail moth and its control by aeroplane and ground dusting.** *Sci. Bull. Dep. Agric. S. Afr.* No. 179, 1938. pp. 48. R.A.E. A28 (403-5).

45.3 : 23.27 : 12.2 : 13.2 (71.1). **The Douglas Fir tussock moth as a shade tree pest.** *Publ. Ext. Div. Agric., Ottawa.* 1939. p. 1. R.A.E. A28 (382).

Hemerocampa pseudotsugata McDunn has caused serious damage to Douglas Firs grown as shade trees in British Columbia. A spray of 1 lb. lead arsenate in 10 gal. water with a suitable spreader is recommended; it should be applied 1-3 weeks after the larvae hatch in spring.

45.3 : 12.12 : 12.2 : 13.2 (74). HOOD, C. E. **Spray experiments for the control of the Elm leaf beetle.** *J. econ. Ent.* 32, 1939 (833-8). R.A.E. A28 (478).

Galerucella luteola Müll. [*G. xanthomelaena* Schr.] is one of the most serious insect pests of *Ulmus americana* in the United States. From trials extending over several years it is concluded that a spray of 3 lb. lead arsenate, 1 U.S. pint fish oil and 100 U.S. gal. water should be applied between the emergence of the last beetles from hibernation (about 25th May) and 10th June in the New England states. The application can be extended beyond this date if necessary. The under surface of the foliage should be treated as thoroughly as possible, as the larvae feed there almost exclusively. Linseed oil can be used in place of fish oil, but if neither is used an additional 1 lb. lead arsenate per 100 U.S. gal. water is required to allow for loss due to rains.

45.3 : 12.12 : 12.2 : 13.2. HOFFMANN, C. H. **Observations on the biology of *Saperda***

tridentata Oliv. and *Magdalis armicollis* Say (Coleoptera). *J. econ. Ent.* 32, 1939 (848-51). R.A.E. A28 (479-80).

A study was made of the biology of *Saperda* (*Eutetrappa*) *tridentata* and *Magdalis armicollis* in view of the possibility of their being carriers of the fungus of Dutch Elm disease. The larvae of *S. tridentata* tunnel in the inner bark and sapwood of Elm and, if abundant, girdle the branches and trunk, causing the death of the tree. It is thought that this species usually attacks devitalized wood, though individuals

have been observed in apparently healthy tissue. Larvae of *M. armicollis* often occur in immense numbers under the bark of dead and dying Elms and occasionally tunnel into adjacent living tissue. Galleries with small larvae were observed in the trunk of one apparently healthy, though suppressed tree. Notes are given on the life cycle of both species. Populations of both beetles can be considerably reduced by removing and burning infested material in autumn and winter, or before the adults emerge in spring.

5. MENSURATION. INCREMENT. YIELD

52. MEASUREMENT OF TREES

52. Roy, H. *Traité de mesurage des bois abattus. [Treatise on the measurement of felled timber.] La Forêt Québécoise* 1 (9), 1939 (16-20); 2 (1), 1940 (17-20); (2), (13-6); (3), (14-8); (4), (17-20, 29-30). [F.]

52:02. GIRARD, J. W., and GEVORKIANTZ, S. R. *Timber cruising*. U.S.D.A. Forest Service, Washington, D.C. 1939. pp. 160.

A manual dealing with the principles and methods of surveying timber resources and with the elements of statistical analysis that are applicable to this work.

52:07 (91.4). SEGUERRA, J. *The establishment of sample plots. Philipp. J. For.* 3, 1940 (1), (69-87). [Bureau of Forestry, Philippines.]

A discussion of the object and procedure in establishing sample plots, of the presentation of the data obtained therefrom and of the expenses of a party engaged on the work basic to this report.

52.1 : 52.2 : 12.2 (941). STOATE, T. N., and BEDNALL, B. H. *Height-girth curves for Jarrah (Eucalyptus marginata). A study of tree heights in the Jarrah forest. Aust. For.* 5, 1940 (41-50).

52.4. HERRICK, A. M. *A defence of the Doyle rule. J. For.* 38, 1940 (563-7). [Purdue University.]

It is suggested that the slab allowance of 4 in. to be deducted from the tree diameter, irrespective of what this may be, is too rigid and is probably the only reason for the inconsistent overrun from this rule. However, it is pointed out that (1) the high percentage of overrun in

small logs is a small volume in absolute quantity, (2) few small logs are sound or straight enough to yield the maximum potential volume, and (3) the cost of processing a small log is not proportional to its size but approaches that of a large log and the high overrun for the former makes a useful adjustment and also makes possible the utilization of some small logs that would otherwise be culled.

In buying logs under the Doyle rule the overrun may be considered as offsetting cull and thus scaling time will be reduced. Furthermore, this rule may influence the woodland owner in favour of better forest practice as it brings the seller a higher return per thousand feet log scale than does a more accurate rule, and it shows a rapid volume increment over a relatively short period and so may influence the owner against early liquidation.

52.4 : 12.2 (76.5). STEVENS, R. D. *Volume tables for some Arkansas hardwoods. Bull. Ark. agric. Exp. Sta.* No. 396, 1940. pp. 46.

52.4 : 12.2 (77.1). ADMAN, A. G., and DILLER, O. D. *Tech. Note Cent. St. For. Exp. Sta.* Nos. 12, 13, 14, 16, 17, 18, 19, 20, 1940.

Volume tables for Yellow Poplar (*Liriodendron tulipifera*), Cucumber (*Magnolia acuminata*), Basswood (*Tilia glabra*), Northern Red Oak (*Quercus borealis*), Sugar Maple (*Acer saccharum*), Black Walnut (*Juglans nigra*), White Ash (*Fraxinus americana*), and White Oak (*Quercus alba*) in Stark County, Ohio.

52.4 : 12.2 (75.8-76.6). WHEELER, P. R. *A rule-of-thumb Pine volume table. Sth. For. Notes* No. 32, 1940 (2).

The approximate cubic volume, including bark, of a forest-grown Pine stem to a minimum 4-in. top diameter may be obtained by squaring half the diameter at breast height less one. An increase or decrease of 10 per cent. should be made for good or poor form respectively.

52.4 : 12.2 (77.7). DILWORTH, J. R. **A local volume table for White Oak.** *J. For.* 38, 1940 (660-1). [Louisiana State University.]

A relatively accurate table for White Oak (*Quercus alba*) of sprout origin representing site conditions common for this species in south central and southeastern Iowa. The method of collecting data and constructing the table are discussed briefly.

52.4 : 57 : 12.2 (77.4-6). GEVORKIANTZ, S. R., and DUERR, W. A. **Volume and yield of Northern White Cedar in the Lake States.** Lake States Forest Exp. Sta., St. Paul, Minn. 1939. pp. 55.

A total of 32 tables that have been compiled from the best data available on growth and yield of *Thuja occidentalis* in this region.

53. SOLID CONTENTS OF STACKED MATERIALS

53 : 12.2. REINEKE, L. H. **Effect of stick length on cordwood volume.** *Tech. Note Ntheast. For. Exp. Sta.* No. 34, 1940. pp. 2.

The shrinkage in space occupied by stacked wood when 4-ft. wood is cut into shorter lengths is shown to vary by species with the crook and roughness of the wood from 13.3 per cent. for Yellow Birch to 23.4 per cent. for Beech. The percentage of solid wood in piles of 4-ft. wood shows a similar wide range by species from 58.8 per cent. for Beech to 65.9 per cent. for Yellow Birch, while the percentage of solid wood in piles of short lengths is shown to be fairly uniform for all species as crook has largely been eliminated.

56. INCREMENT. DIAMETER, HEIGHT, AND VOLUME INCREMENT

56-7 : 21.6 : 12.2 (74.9). MOORE, E. B., and WALDRON, A. F. **Growth studies of Southern White Cedar in New Jersey.** *J. For.* 38, 1940 (568-72). [New Jersey Department of Conservation and Development.]

White Cedar (*Chamaecyparis thyoides*) in southern New Jersey usually grows in dense, pure, even-aged stands on wet sites along

stream bottoms, and is believed to be a temporary stage in the gradual succession towards hardwoods. Sample plots representing two degrees of thinning and controls were established in representative stands of this species in 1927-8. Measurements made at the end of two 5-year periods since then and analysis of related economic factors indicate that: (1) Thinning is justified only in stands having a stocking of at least 200 sq. ft. of basal area per acre and a site index of 45 ft. or more. (2) Thinnings should be of medium intensity, removing about 35-40 per cent. of the basal area. (3) Thinnings should be delayed until there is sufficient material of the size to make shade-tree stakes, arbor poles and fence posts, which can be removed to make the operation financially profitable. However, thinnings will not be advantageous after the stand has reached 65 years.

57. RATE OF GROWTH. YIELD. INCREMENT AND YIELD TABLES

57 : 12.2. HORNIBROOK, E. M. **A preliminary yield table for selectively cut Lodgepole Pine stands.** *J. For.* 38, 1940 (641-3). [Rocky Mt. Forest & Range Exp. Sta.]

A study was made from 1937 to 1939 in which the increment core method of obtaining yield data in Lodgepole Pine cutover stands was adopted to supplement insufficient data from permanent sample plots. The multiple correlation and regression method of analysis was used in which all data were coded in logarithms. By this method and analysis a linear relationship between the dependent and independent variable was realized and 91 per cent. of the variation in yield was found to be associated with variations in reserve volume and time since cutting. The standard method of determining site index was unsatisfactory for the cutover Lodgepole Pine stands. Accurate information on mortality was obtained only from permanent sample plots. A satisfactory equation for estimating future yield was developed, and is presented in alinement chart form together with a table of mean annual gross increment for varying reserve volumes and time since cutting. *Author's summary.*

57 : 21.6 : 32.1 : 12.2 (73). THOMSON, W. G. **A growth rate classification of southwestern Ponderosa Pine.** *J. For.* 38, 1940 (547-53). [U.S. Forest Service.]

Under this tree classification, which is a modification of Keen's system, a tree is recognized as belonging to one of four broad age classes, each of which is subdivided into four vigour classes for a total of 16 age and vigour divisions. These are described and illustrated. Age classes are recognized by such

external characteristics of the tree as d.b.h., colour and condition of bark, shape of the top, and branching habit, while size of crown and the abundance and condition of needles are considered the best indicators of tree vigour. [Cf. *For. Abs.* 1 (158)].

6. MANAGEMENT. WORKING PLANS. SURVEYS

6 (75.8-76.6). STRAUSS, C. W. **The need for better forest management in the South.** *Sth. Lumberm.* 159 (2009), 1939 (165-8). [U.S. Forest Service.]

6 : 5 : 35 (74 : 75.1-5 : 76.9). **Timber Management Standards: Timber sales** [NF-B4]. Regional Forester, Eastern Region, Victor Building, Washington, D.C. Dec. 20, 1939. pp. 73.

Official instructions for Region 7, U.S. Forest Service.

61. SURVEYING. MAPPING. PHOTOGRAPHY

61. ANDREWS, G. S. **Notes on interpretation of vertical air photographs.** *For. Chron.* 16, 1940 (202-15). [British Columbia Forest Service.]

Items discussed in this paper include: (a) the pictorial elements—tone, texture, shadows, and outlines—which together build up a comprehensive picture, (b) the influences of central perspective and scale, (c) features of landscape, which occupy a position of greatest prominence in air photography, and include water, rock outcrops, alpine slides, snow, ice, and forest types. Relatively detailed notes are given on the last of these, with particular reference to forest types in British Columbia.

61 (59.1 : 71). BRAITHWAITE, J. D. **Canadian aerial photography for Burma.** *Indian For. Rec.* [n.s.] *Silviculture* 4, 1940 (1-96). [Burma Forest Service.]

A report on the development of aerial photography in Canada and in particular on its use in forest mapping. The author discusses the equipment, methods, and technique used in aerial photography, methods of mapping from verticals and obliques, the use of photographs in mapping and thinning plantations and in stock mapping, the transfer of detail from

photograph to map and the analysis of forest conditions as shown by the photograph. Suggestions are made for the use of aerial photography in forest management in Burma.

61 : 07.7. PROBYN, E. H. **The use of a rangefinder in river survey.** *Niger. For.* 1, 1940 (39-41).

61 : 43.1. NEWMAN, S. A. **The grid-area method for determining areas of irregular figures: an application of the mean ordinate principle.** *J. For.* 38, 1940 (632-5). [U.S. Forest Service.]

The device used is a transparent plastacele square on which are etched circles of predetermined radii, and parallel chords with a spacing consistent with the desired accuracy and numbered consecutively. In the example considered this grid-area device is superimposed over a 'seen-area' map for the purpose of measuring the area of the 'seen-area' segments. The etched circles are correlated with the boundaries of the 6-, 9-, and 12-mile concentric circular ranges of the fire tower and the parallel chords are spaced $\frac{3}{8}$ in. apart. The total length of chordage along the parallel lines is measured for each circle. Finally the lengths of chords passing through all 'seen area' segments are added together and the total applied to the equation,

$$\frac{\text{Amount of 'seen-area' chord segments}}{\text{Total length of chordage in circle}} = \frac{\text{'Seen-area'}}{\text{Total area of circle}}$$

For maps on which the outlines are relatively uniform in shape and direction of the long axes it is believed that more accurate values will be obtained by holding the grid at 45° to the average direction of the long axes, whereas for maps with irregular figures throughout the angle of the grid does not matter.

64. DESCRIPTION OF SITE.

ASSESSMENT OF QUALITY

64 : 12.2 (75.8). DAVIS, V. B. **Forest site quality in Georgia.** *Sth. For. Notes* No. 33, 1940 (1-3).

The average height of 50-year-old dominant trees of the important Pine species is used as the basis for a broad site-quality map for the Pine and Pine/hardwood types.

65. DESCRIPTION OF GROWING STOCK

65 : 07.7. RULISON, D. E. **A useful multiple tally register holder.** *J. For.* 38, 1940 (659-60). [Northeastern Forest Exp. Sta.]

Description of a home-made holder fitted with three tally registers that are operated in one hand.

65 : 23.1 : 12.2. WELLNER, C. A. **Relationships between three measures of stocking in natural reproduction of the Western White Pine type.** *J. For.* 38, 1940 (636-8). [Northern Rocky Mt. Forest & Range Exp. Sta.]

The three measures used in determining the stocking of natural reproduction of this species in northern Idaho are: (1) number of trees per acre, (2) percentage of milacres (units 6.6 feet square) containing one or more trees, and (3) percentage of 4-milacres containing one or more trees. As all three measures are frequently used, a method of converting one to another is desirable. For this purpose data for White Pine and other species at various densities were collected by the three measures and correlated on two graphs, the number of trees per acre being represented on the scale at the base of each graph, the milacre and 4-milacre tallies each being represented by a perpendicular scale. Curves representing average values are drawn on both graphs. The figures are not applicable to stands over 15 years old and they should be used with caution on small areas.

65 : 56-7 : 12.2 (945). HONE, A. A. **Comparative enumeration in growing stock. Victorian Ironbark Box forest.** *Aust. For.* 5, 1940 (57-9).

A comparison of enumerations made in 1924 and 1937. Red Ironbark (*Eucalyptus sideroxylon*) is the principal species. Red Stringybark (*E. macrorrhyncha*) is associated with it on ridge tops, and Grey Box (*E. hemiphloia*) and Yellow Gum (*E. leucoxylon*) are often found on gully alluviums.

66. POSSIBILITY. YIELD REGULATION

66. STEVENSON, D. D., and MEYER, H. A. **An application of the continuous inventory system of management.** *J. For.* 38, 1940 (661-4). [Pennsylvania State College.]

As a demonstration of this system of management a plan was drawn up for the farm woodlands of the Pennsylvania State College. The first step in the management of a 332-acre forest of the Oak/Pine type was a one hundred per cent. cruise of the well-stocked stands, which make up 50 per cent. of all the woodlands and plantations. Height measurements were taken and a common local volume table was developed for hardwoods and softwoods. Data from the inventory were divided into three diameter groups—7-13 in., 13-21 in., and 21 in.+ as a step in analysing the present condition of the stands, board-foot volumes being determined for each group. In order to arrive at some idea of the normal growing stock of the forest, which was decided on as the ultimate goal of management, comparison was made between data from yield tables for even-aged upland Oak forests and from cruise notes of uneven-aged virgin forests of the same type on a slightly poorer site. A profitable normal growing stock was considered to lie somewhere between the extremes represented by these sources of information and a volume of 1,800 cu. ft. per acre was determined as the normal for the time being, to be divided among the three diameter groups in the order of 45 per cent. for the 7-13 in. class, 40 per cent. for the 13-21 in. class, and 15 per cent. for the 21 in.+ class. As the present volume of the woodlands is far below normal it has been decided to cut only 25 cu. ft. per acre per year from the material 7 in. d.b.h. and over during the first six years of management. Details of the management plan for the first six-year period are discussed briefly. An essential characteristic of the system is that the d.b.h. of all cut and dead trees must be obtained and tallied in the 'felling record' before they are removed.

7. ECONOMICS. VALUATION. FINANCE. PROFIT AND LOSS

7 : 32.5 : 85. NIX, L. A. **Analysis of woods overhead expense.** *Pulp Paper Mag. Can.* 41, 1940 (615-8). [Bathurst Power & Paper Co., Ltd.]

As a result of increased mechanization overhead expenses are rapidly becoming the dominant element in logging costs. Variable overheads can be estimated for any volume of production and budgets should be elaborated allocating responsibility for such overheads. Provision should be made for recognition by bonus as an incentive to saving on operation costs.

72. GENERAL PROBLEMS OF PROFIT AND LOSS

72 : 22.1 (73). ROTHERY, J. E. **Analysis of financial returns from liquidation and the**

two-cut system. *J. For.* 38, 1940 (538-44). [U.S. Forest Service.]

A detailed analysis of costs and returns resulting from two different methods of forest management, the clear-cut plan and the two-cut plan, the data having been obtained from a recent publication of the Charles Lathrop Pack Forestry Foundation, 'The two-cut system of forest liquidation in the Lake States region' by C. H. Stoddard, Jr. The final calculation in the present paper shows a substantial difference between the two methods in favour of the two-cut plan. This is accounted for largely by growth and by the early recovery of the more profitable timber. It is pointed out that the uncertainty of many factors affecting the lumber industry does not favour a high rate of capitalization.

9. FOREST POLICY

90. GENERAL PRINCIPLES OF FOREST POLICY

90 : 81 (82). Reglamentación de las funciones de la División Forestal. [**Regulation of the functions of the Forestry Division.**] *Maderil* 11 (144), 1940 (9-10, 25-8). [Span.]

Full text of the decree of 6th June, 1940, by the Minister of Agriculture of Argentina. Apart from industrial and protection forestry proper, the functions of the Division comprise wood-utilization research and the creation of a forestry museum.

90 : 98 (73). **National forest policies recommended by the National Lumber Manufacturers Association for the lumber and timber products industries.** **Statements in public hearings before the Congressional Joint Committee on Forestry,** January 16, 17, 1940. Washington, D.C. 1940. pp. 37.

91. BENEFICIAL EFFECTS AND ECONOMIC SIGNIFICANCE

91 : 13.1 (71.2). CLARKE, C. H. D. **A biological investigation of the Thelon Game Sanctuary.** *Bull. nat. Mus. Can.* No. 96 (*Biol. Ser.* No. 25), 1940. pp. 135.

91 (66.9). COSTELLO, J. W. **Forest reservation problems in Niger Province.** *Niger. For.* 1, 1940 (46-7).

At present the two main problems of reservation are the great dispersion of agricultural settlements and reconciliation with the needs of the gold-mining interests. The solution of the first problem appears to lie in a thorough examination of the areas to be reserved in order to find places as nearly uninhabited as may be compatible with the objects of reservation, while the second problem may be overcome either by a complete segregation of mining areas and forest reserves, or by some form of compromise that will admit of mining in forest reserves.

91 : 93 : 96 : 97.1 (66.9). GRAY, G. C. R. **Forest conservation by clans in North Benin.** *Niger. For.* 1, 1940 (28-32).

Recently there has been a considerable response by Native Authorities to reservation schemes. Clans are to be compensated for reservation by removal of forestry restrictions from the rest of their territory.

91 : 23.3 (73). SELKE, A. C. **Prairie forestry from a prairie dweller's point of view.** *J. For.* 38, 1940 (545-6). [Dickinson State Teachers' College, Dickinson, N. Dak.]

While natural tree growth is to be found in both the Great Plains and the prairie regions under certain favourable site conditions, on the poorer soils it is probably necessary to give the trees a start, although in general their later development requires little care. Among the important benefits of the dry-land forests are their recreational possibilities, esthetic value, protection of bird life, and possibly the grazing of either domestic or game animals as a precautionary measure against fire hazard. It is suggested that some form of common ownership of the existing forests would be the most effective protection against over-exploitation.

92. FOREST LAW

92 : 94.3 (54.2). SINHA, J. N. **The Chota Nagpur Private Forests Bill, 1939.** *Indian For.* 66, 1940 (473-6).

Owing to the rapid and destructive exploitation of the private forests by both landlords and tenants in the Chota Nagpur Division, Bihar, and to the lack of response by the landlord to the provisions of Section 38 of the Indian Forest Act, 1927, by which private forests are put under Government protection at the request of the owners, it is now considered necessary to empower the Government to take over suitable private forests for management. A summary is given of the provisions of the Bill which is being considered by the Bihar Government to enforce this policy.

92 : 82 (73). BURT, W. R. **Wages and hours and forest conservation.** *J. For.* 38, 1940 (535-7). [National Lumber Manufacturers' Association.]

A discussion of certain requirements of the Wage and Hour Law, June, 1938, and of a recent interpretation of this law by the Administrator whereby labour engaged in fire fighting within a 'protected area' is considered technically to be employed by the Government and so becomes exempt from the Act.

92 : 95 (73). MURPHY, L. S. **State forest tax law digest of 1939.** U.S.D.A. Forest Service, Washington, D.C. 1939. pp. 52 + 4.

94. OWNERSHIP, ACQUISITION AND ALIENATION

94.1 (73). BROWN, N. C. **Community forests.** Forest Service, U.S. Department of Agriculture, Washington, D.C. 1939. pp. 36.

94.1 (74.4). **The first quarter century of the town forest in Massachusetts.** *Bull. Mass. For. Park Ass.* No. 163. 1939. pp. 11.

In this period 107 towns in Massachusetts have set aside a total of 31,702 acres under the Town Forest Act and have planted more than six million trees.

95. FOREST TAXATION. FOREST LOANS

95 (76.2). CRAIG, R. B. **Taxes on forest property in five selected counties in Mississippi, 1936-1939.** *Occ. Pap. Sth. For. Exp. Sta.* No. 89, 1940. pp. 9.

95 (76.2). CRAIG, R. B. **Taxes on forest property in two selected counties in Mississippi, 1936-1939, with state averages.** *Suppl. to Occ. Pap. Sth. For. Exp. Sta.* No. 89, 1940. pp. 5.

95 : 92 (75.8-76.6). CRAIG, R. B. **The forest tax delinquency problem in the South.** *Occ. Pap. Sth. For. Exp. Sta.* No. 92, 1940. pp. 14.

97. RELATION OF FOREST TO AGRICULTURE, PASTURE, AND INDUSTRY
97.1-2 (66.9). CLARKE-BUTLER-COLE, R. F. **The influence of permanent crops on rural economy in the western provinces of Southern Nigeria.** *Niger. For.* 1, 1940 (32-5).

Some of these crops, and especially Cacao, are frequently grown on soils to which they are ill-adapted, and which deteriorate as a result. It is feared that this may lead eventually to land shortage.

97.1 (71). MERCIER, T. **D'une formule nouvelle d'établissement. [On a new formula for land settlement.]** *La Forêt Québécoise* 2 (3), 1940 (31-42). [F.]

The recently established Grande-Vallée colony, Gaspé County, Quebec, is described. The livelihood of the colonists is derived to an appreciable extent from the utilization of Crown land forests surrounding the agricultural allotments. The forests are reserved for the use of the colony and are exploited according to a working plan which ensures sustained yield. The colonists form a co-operative syndicate for the purpose of organizing forest utilization, the work being done on a family basis. The scheme is State-subsidized and largely State-

controlled. It is argued that such combination of agriculture and forestry is a promising means of enlarging the scale of colonization work, since it permits the settling of many more families per unit area of the available agricultural land. The projected application of the system to certain localities, situated in the midst of Crown forests, which have been leased to industrial companies, is discussed.

97.1 (77.5). JOHNSON, V. W., HENDERSON, S., and MARSHALL, J. H. **A land program for Forest County, Wisconsin, based on an analysis of land use problems.** *Tech. Bull. U.S. Dep. Agric.* No. 687, 1939. pp. 111. [Bureau of Agricultural Economics.]

97.1 : 90 (97). **Colonial forestry and countryside problems.** *Nature, Lond.* 146, 1940 (567-8).

97.1 : 91 (54.2). NEGI, S. S. **Forest development work in the United Provinces.** *Indian For.* 66, 1940 (397-409).

Only about 4 per cent. of the total area of the United Provinces is under forests, which are small and badly distributed. Consequently fuelwood and timber are prohibitively costly to the people in the densely populated plains, and they are compelled to burn cow-dung which should be used to fertilize their fields. In order to cope with the problem of proper land use in this region a Forest Development Division was created under the Forest Department in 1938. The organization of this Division and its activities during 1938 and 1939 are discussed. These fall under two main headings: (a) propaganda activities to show the landowners and tenants the value of the proposed work and to gain their useful co-operation, and (b) the technical instruction, assistance and supervision of the work.

97.2 (71.3). MARRITT, I. C. **The farm woodlot.** *Bull. For. Br. Ont.* No. 2, 1939. pp. 64.

A semi-popular bulletin on woodlot management for the farmer and woodlot owner, with special reference to southern Ontario. Chapters are included on protection, management and improvement, measurement and sale of products, and management for special products.

97.2 (77.6). ALLISON, J. H., and CUNNINGHAM, R. N. **Timber farming in the Cloquet District.** *Bull. Univ. Minn. agric. Exp. Sta.* No. 343, 1939. pp. 35.

The forest resources of this district in Minnesota were exploited too rapidly in the past and now only 40-50 per cent. of its wood requirements can be supplied from within the district. Recommendations for the future development and management of this resource are based on a study of present conditions.

97.2 : 35 (74.2). MACLEOD, A., and CHANDLER, J. **The marketing of farm woodland products in Carroll County, New Hampshire.** *Bull. N.H. agric. Exp. Sta.* No. 318, 1939. pp. 31.

97.3 : 34.21 : 45.1 (77.2). DENUYL, D., and DAY, R. K. **Woodland livestock carrying capacities and grazing injury studies.** *Bull. Ind. agric. Exp. Sta.* No. 391 [revised ed.], 1939. pp. 16.

The data obtained indicate that under present grazing practices forage production in farm woods is insufficient to maintain animal weights over a six-months' season and that continued grazing gradually destroys both the forage and the timber-producing capacity of the woods.

97.3 : 97.1-2 (485). NYBLOM, E. Skogsbetets omfattning i Västmanlands län. [The extent of forest pasturage in the county of Västmanland.] *Skogen* 27, 1940 (209-10). [Sw.]

General figures are given to illustrate the extent of forest grazing in the outlying lands of properties in Västmanland. Uncontrolled grazing is decreasing, mainly as a result of fencing carried out under the provisions of a law of 1933, but still exists on an area of 123,000 ha. out of a total of 435,000 ha. of such lands. Agricultural and forestry authorities should therefore continue to urge upon landowners the advantages of controlled grazing.

97.3 : 92 : 93 : 34.21 (54). SAGREIYA, K. P. **Grazing control in reserved forests.** *Indian For.* 66, 1940 (409-18).

The author discusses the grazing problem in Bombay Province with reference to and in support of the draft grazing rules which had been prepared by Mr. E. A. Garland and were submitted to Government for consideration but were dropped as not being in agreement with

public sentiment. These rules in laying down certain broad principles discriminate between productive and uneconomic livestock, advocate adequate grazing grounds for favoured animals and public ranches for surplus stock, and limit the stocking of a pasture to its carrying capacity. A brief description is given of the method of administering the grazing rules of the Central Provinces, which are based on the principle of separating 'essential' and 'surplus' livestock.

98. STUDY OF THE TIMBER MARKET

98.1 : 98.3 : 33.0 (95). d'ESPEISSIS, J. L. **The timber industry in the Territory of New Guinea.** *Aust. For.* 5, 1940 (33-6).

The value of timber exports from this country increased greatly in 1937-8 to £6,030 for logs, and £480 for sawn timber. Among the more valuable woods for export is Laup or New Guinea Walnut (*Dracontomelum mangiferum* Blume), which is established as a cabinet wood.

BOOKS

TROUP, R. S. **Colonial forest administration.** Oxford University Press. 1940. pp. 476. 35/-.

It was generally known that the late Professor Troup had been engaged on working up into book form the substance of the course of lectures he had been giving on Forest Policy and Administration to the probationers for the Colonial Administrative Service, and though he did not live to see the final result, he was fortunately able to complete the MS. and Mrs. Troup and Professor H. M. Steven have seen it through the Press. The scope of the book is much wider than the title might lead one to expect and as the author notes in the preface, many of the scientific and technical aspects of forestry have also been touched on—sometimes at fair length. The result is a bulky and rather expensive volume on Colonial Forestry, which will be an exceptionally valuable reference work for the Colonial Secretariats and for forestry institutions everywhere, but which is not the compact little vade-mecum on the subject which the probationer would probably find most useful.

A feature of the book which is apparent throughout is the enormous value to the author of his background of experience in India and Burma with their relatively long history of forest administration and management: apart from the part played in the Forest Departments of so many of the Colonial Dependencies by men of the Indian Forest Service, it protrudes on the notice time and again that the Colonies can, if they will, profit from India's experience particularly in the way of what to avoid.

Part I is divided into 21 sections covering almost the whole field of forestry. The opening ones deal with the utility direct and indirect of forests and give a very informative survey of the nature and the extent of the forest destruction which has already taken place in the different Colonial Territories. Reasons and procedure for forest reservation follow, with a section on Forest Protection. The warning against the common misinterpretation of the term 'reserved' forest is very much in place, as also is the stress laid on the need for dealing with forest reservation as part of a general land utilization survey, provided this course does not result in dangerous delay: staggering rates

of increase in population as on the Gold Coast (p. 128) necessitate this proviso.

There are brief and very lucid accounts of the meaning and nature of working plans and of yield calculation and control, the latter going rather further into technical detail than is perhaps necessary. In Section XIII on Forest Exploitation, the author emphasizes the importance of pushing the use of second-class timbers. The section on ownership refers one to the author's other work on State Control, but one misses here any indication of the extent to which such control has actually been applied to private forests. The absolute necessity for adequate safeguards in the management of forests entrusted to village and other communities is advisedly impressed on the Administrator who has generally shown himself to be much more trusting and optimistic in the matter than the Forester, eventualities usually supporting the latter.

There follow interesting sections on forestry in relation to agriculture and mining with some surprising data for the extent of shifting cultivation (notably in Nigeria) and of the demand on the forest made by the mining industry—estimated for the South African gold mines as the annual outturn from 100,000 acres of plantation (p. 255). The section on administration includes a recommendation, which, coming from as keen and experienced an experimentalist as Troup, must be given considerable weight: it is to the effect that in the earlier stages of forest development in a colony, the primary need is for reservation, demarcation, protection and survey work, calling for efficient administrative and executive work likely to keep all the staff which can be afforded fully occupied: in this stage whole-time specialist and research officers may be a luxury which cannot be afforded. The solution may be found in co-operative effort between neighbouring colonies with similar or common problems.

Part II, occupying about one-quarter of the volume, deals with the Colonial Dependencies *seriatim*, giving summaries of the forest position under the four heads Administration, Policy, Reservation and Statistics. It provides useful reference for the dependency one is immediately concerned with, and equally useful comparative data for the rest.

H. G. CHAMPION.

44.3 : 45.3 : 02. MARTIN, H. **The scientific principles of plant protection with special reference to chemical control.** Edward Arnold & Co., London. 3rd edition, 1940. pp. 385.

Plant pathologists of all types will be acquainted with the earlier editions of this book, which is probably the best work of reference, in English, on the subject of the chemical control of plant diseases, whether caused by parasite or pest. The present edition has been revised to an appreciable extent, to allow for the incorporation of recent work, but it follows strictly on the lines of the previous edition and contains no outstanding new features. It is of approximately the same size.

For the sake of new prospective readers it may be stated that the outline of the book is as follows:—It opens with four chapters generally introducing the subject of plant protection and also dealing with plant resistance, the influence of external factors on susceptibility and biological control. The next five chapters deal very fully with fungicides and insecticides. Then follow four chapters concerned with weed killers, fumigants, seed treatment and soil treatment. The three concluding chapters are concerned with toxic action and chemical constitution, traps and the treatment of centres and vectors of infection. There is an author and a subject index.

Forest pathologists will find this book of considerable use: this applies especially to mycological pathologists who are concerned with chemical means for the control of disease. Forest entomologists are better catered for in this direction than forest mycologists. It must not be expected that this book deals specifically with forest problems. Actually the control of tree diseases arises only occasionally, and then usually in connexion with such a plant as Willow, which is not grown as a forest crop. Nevertheless, the substances and methods used by the forester in the control of parasitic diseases are sufficiently similar to those adopted by the agriculturalist or horticulturalist for this work to satisfy most of his requirements.

W. R. DAY.

12.19.1 : 12.2 (67.6). EGGELING, W. J. **The indigenous trees of Uganda.** Govt. Printer, Entebbe, Uganda. 1940. pp. xxii + 296.

All workers on the trees of Uganda will welcome this published form of a thesis for the degree of Ph.D. Edinburgh. Though it

appears in the form of a flora, with keys to families, genera and species, descriptions, and a wealth of clear photographs and line drawings, it is more of a personal product than a compilation of all existing literature. Mr. Eggeling quotes for preference his own specimens where available, and his own notes in most cases. Even where he has none of his own records to quote, he is able to draw upon the field notes of observers who have experience of the trees as living ecological and forest entities. Much useful information on the properties of the woods is also included.

Since most of the work was prepared in Uganda, far from large libraries and herbaria, no attempt has been made to include all available literature and citations. Some omissions and errors are inevitable in these circumstances, but the main purpose of the book, as a handbook for the forester, is not necessarily greatly interfered with on that account.

An alphabetical order of families and genera was chosen, probably because the basis of operations was the alphabetical Uganda Check List. This is perhaps unfortunate, because the order proposed by Hutchinson is used both in the Uganda Herbaria and in the Herbarium at the Imperial Forestry Institute, where the foresters who will use the book are generally trained. Thus the desired object of ease of reference does not seem to have been quite attained by an alphabetical arrangement.

These superficial criticisms do not detract seriously from the fact that both author and printer have produced between them a very useful and elegant work. It has already proved useful at the Imperial Forestry Institute, and may be commended to the attention of everyone with an interest in Tropical African trees. If the writer did not know Mr. Eggeling, he would find difficulty in believing that the latter had only been some eight years in Uganda before publishing his thesis.

A. C. HOYLE.

12.12 : 42.5 (71). **Effect of sulphur dioxide on vegetation.** National Research Council of Canada, Ottawa. 1939. pp. 447. N.R.C. No. 815.

This book is a compilation of a series of papers by a number of authors. It deals, firstly, with field studies of the effect of fumes, from the lead-zinc-silver ore smelter at Trail, British Columbia, on the growth and development of forest and agricultural crops and,

secondly, with fumigation experiments in which the conditions causing damage and the development of plants under those conditions were studied. A very useful 18-page summary of the whole book is given in the last chapter. There is no index and the table of contents merely gives the titles of the papers of which the book is made up. The lack of an index is a serious handicap and will undoubtedly limit the usefulness of this work.

The discharge of sulphur dioxide in industrial areas, and from smelter plants in particular, presents a number of now well-known problems. The satisfactory solution of these is largely an economic rather than a technical matter, though further technical advances in the control and utilization of the waste discharges of industry are doubtless needed and will be made. Smelter fumes differ from the smoke and gases of the ordinary industrial town in their greater local concentration and, correspondingly, increased poisoning effect. The effect of the very large Trail smelter is best described in the following words taken from the summary (p. 432), 'The area immediately adjoining the Trail smelter area has been denuded of the native grasses and conifers, although a few hardy shrubs and some broad-leaved trees are still present. Conifers begin to make their appearance at a distance of about 12-15 miles from the smelter. Douglas Fir has been most severely affected in comparison with other species. A few more resistant Yellow Pine and Larch have managed to survive in the area where the Fir has been killed.' Larch has been injured in early May, its season of greatest susceptibility, for a distance of about 30 miles south of Trail.

The creation of a scene of devastation such as this is an exceptional occurrence, even in modern industry, and its continuance appears to have been remedied at Trail by the utilization of the waste sulphur dioxide to form sulphur, sulphuric acid and fertilizers, to a sufficient extent to reduce atmospheric contamination below the point where appreciable poisoning occurs. The chief value of this book lies not so much in its description of a special and rather exceptional problem, as in the recorded careful observations of sulphur dioxide poisoning and contamination, and in the experimental methods and results devised to confirm these observations.

A great deal of the previous work of this nature had been carried out in Germany,

especially in connexion with the Saxon industrial area, and the more important textbooks are in German. The work under review is sufficiently comprehensive to serve, to a considerable extent, as a textbook in English for those in English-speaking countries who are concerned with forestry and agricultural problems in areas where the atmosphere is contaminated with sulphur gases. It should, also, serve a particularly useful end in stressing the need, in the study of atmospheric contamination, of basing conclusions on careful observation and measurement. Various adventitious values also arise. Thus one of the major effects of sulphur dioxide poisoning is to kill leaves wholly or partly and so cause defoliation. Growth studies on affected trees are thus, to a considerable extent, studies in defoliation, and are of value in problems where defoliation arises from other causes than sulphur poisoning.

Adequate references to literature are given in connexion with the various papers. The book is well printed and the illustrations good and sufficient. Many of those which illustrate types of injury to leaves are excellent and should help in diagnosis.

The Canadian National Research Council is to be congratulated on the completion and publication of a very useful series of researches.

W. R. DAY.

31.1 : 33 : 12.2 (91.4). REYES, L. J. **Philippine woods.** *Tech. Bull. Philipp. Dep. Agric. Comm.* No. 7, 1938. pp. 536 + 88 plates.

Technically this publication is a 'Bulletin', but, with 536 pages of print and 88 plates, it is for all practical purposes a book. It is intended to replace Schneider's 'Commercial Woods of the Philippines: Their Preparation and Uses', which is now not only out of print but out of date, and follows much the same plan. The most notable changes are the disappearance of the introductory chapters on general wood technology and the introduction of detailed descriptions of the macroscopic structure of the timbers. The additional matter and the use of a larger and more easily read type has increased the size of the Bulletin to more than double that of its predecessor.

The value of a work of this nature is directly dependent on the accuracy of the systematic determinations, and Schneider's bulletin suffered considerably from deficiencies in this respect. The reviewer is not in a position to assess the progress made in the systematization

Philippine trees since that time, but progress there has undoubtedly been, and the fact that Dr. Merrill has been responsible for the identifications should assure a high degree of confidence on this score. In the difficult group of the Dipterocarps, numerous footnotes give evidence that Mr. C. F. Symington's extensive knowledge of this family has been drawn upon to elucidate particular problems. It is notable that in this group the number of species seems to have grown fewer rather than larger. For example, Schneider gives the number of species of *Shorea* as twenty, whereas in the present volume the number is reduced to twelve.

The advance in pure systematics has made it possible to clarify the identity of the timbers included under particular trade names, and considerable changes are apparent in certain groups. Schneider, for example, included under 'Yakal' four species of *Hopea*, one *Isoptera* and one *Shorea*, while Reyes includes under this name five *Hopeas* (the specific names of two only being the same as in Schneider's list) and four *Shoreas*, among which is included the erstwhile *Isoptera borneensis* Scheff.

The book includes photomicrographs of the end surfaces of over 250 species at low magnification. These are photographs of genuine end surfaces and not negatives taken by transmitted light, and the satisfactory results obtained are evidence of considerable skill in preparing the surfaces.

L. CHALK.

33.51. COULON, J.-P. Les bois de mine. [Mining timber.] Presses Universitaires de France, Paris. 1940. pp. 97. [F.]

Timber is still an indispensable material for the most essential industries, and large quantities of it are used by coal, iron, and other mining concerns. The production of mining timber in France is a very specialized industry, and J.-P. Coulon, Assistant Inspector of Forests, and Lecturer on Mining Timber at the Senior School of Forestry, gives a detailed picture of it in this small book. The special terminology employed by the industry, and the different requirements of the mining companies, are disconcerting to the uninitiated; whilst the customary methods of conversion and marketing are unfamiliar to them. The annual consumption of mining timber in France reaches 2,400,000 cu. m., and is an important market for the French forests, involving supplies of several different types of produce:—straight stems of

coppice, and poles from both hardwood and softwood trees. This book has been written to provide information about the industry for owners of forest land. There are eleven concise chapters dealing with the principal aspects of the subject which are as follows:—Utilization of mining timber; marketing, including mining companies' specifications, quality, delivery and prices; exploitation, including selection of timber, felling and barking, conversion, piling, and rates of payment; transport; purchase of standing trees and contracts for buying timber; unbarked mining timber; and transport by rail.

31 : 33 : 12.2 (71). McELHANNEY, T. A. Les bois du Canada: leurs propriétés et leurs usages. [The timbers of Canada: their properties and uses.] Dominion Forest Service, Ottawa. 1940. pp. 358. [F.] [Forest Products Laboratories of Canada.]

This is a translation of the English edition which was prepared at the request of the Canadian Lumbermen's Association and published in 1935. The book brings together a large amount of information chiefly obtained from investigations at the Forest Products Laboratories of Canada and elsewhere in the Dominion and forms a comprehensive work of reference to the properties and uses of Canadian timbers.

Descriptions are given of the commercial species, timber resources and timber production of the country, as well as of the standards of measurement and definitions of terms used in the timber industry. There are also chapters on wood structure; the mechanical and physical properties of Canadian woods; the seasoning of timber; decay and stains in wood; preservative treatment of wood; pulp, paper and related products; the chemical utilization of wood; and classified uses of Canadian woods. A full bibliography is appended to each chapter for readers requiring further data.

Sixteen tables, which are included in an appendix, provide information on the mechanical properties of the various species, as well as data of value in computing safe loads in structures.

11.6 : 23.3 : 38 : 92 : 96 (44). YANKOVITCH, T. Le reboisement et la correction des torrents dans le département des Basses-Alpes. [Reforestation and torrent training in the Département des Basses-Alpes.] Imprimerie Saint-Blaise, Paris. 1940. pp. 158. [F.]

Though this doctoral thesis breaks no new ground in the principles or practice of 'mountain restoration' under Mediterranean conditions, it is the first general account to be published of such work in the Basses-Alpes, and should interest conservationists as further evidence of successful efforts to remedy the evils of deforestation and subsequent erosion. The first chapter contains a useful historical review of French legislation concerning torrent training and afforestation in mountainous regions. Two rather lengthy chapters follow on the geological, meteorological, biological, and topographical factors that contribute to the formation of torrents, and on the principles and methods of torrent training and afforestation work, including choice of species. Detailed consideration is then given to work carried out in the catchment area of the Torrent du Bourget. A final chapter on the damage caused by torrents in the Basses-Alpes as a whole is divided into three sub-chapters, of which the first deals with the direct damage caused by erosion, deposition of eroded material, and landslides; the second with indirect damage through general social impoverishment and consequent depopulation; and the third with the history of measures taken by the Forest Service. In an appendix is

given an annotated list of species suitable for stabilizing banks, dams, &c., for forming scrub, and for re-establishing pasture.

P. G. B.

35 : 98 : 92 (410). DAVEY, R. **Timber in war-time**. Estates Gazette Ltd., 33-35, Kirby Street, London, E.C.1. 1940. pp. 56.

This booklet though complete in itself supplements 'Marketing timber', which was published shortly before the war [cf. *For. Abs.* 1 (110)]. The bulk of the subject matter is marketing as affected by war-time conditions, and while this useful information is presented against the background of the author's personal experience, much of it is of necessity a digest of official Orders. The final chapter deals with 're-stocking felled areas' in just over two short pages and thus painfully resembles a guide to a pious hope.

I. K.

12.19.1 : 12.2 (91). CORNER, E. J. H. **Wayside trees of Malaya**. Vol I [text], pp. vii + 770; Vol II [plates], pp. 228. Govt. Printing Offices, Singapore. 1940.

97.1 : 7. ELY, R. T., and WEHRWEIN, G. S. **Land economics**. Macmillan Co., New York. 1940. pp. 512. Soil Conserv. Lit. 4 (127).

NOTES FROM ANNUAL REPORTS

Reports examined include: *Alabama*: Annual report, Department of Conservation, 1st October–30th September, 1939. *Alberta*: Annual report of the Department of Lands and Mines for the fiscal year ended 31st March, 1939. *Arkansas*: Fifty-first annual report of the University of Arkansas, College of Agriculture, Agricultural Experiment Station, for the fiscal year ending 30th June, 1939. *Australia* (1): Annual report of the Commonwealth Forestry Bureau for the year 1939. *Australia* (2): Annual report of the Division of Forest Products, Council for Scientific and Industrial Research, for the year 1939–40. *Bihar*: Annual progress report on forest administration for the year 1938–9. *Canada*: Twenty-second annual report of the National Research Council of Canada 1938–9. *Ceylon*: Administration report of the Conservator of Forests for 1939. *India and Burma*: Forest Research in India and Burma, 1938–9. Part I. *Kenya*: Forest Department annual report 1939. *Malaya*: Annual report on forest administration in Malaya, including Brunei, for the year 1939. *Manitoba*: Annual report of the Forest Service, fiscal year ending 30th April, 1939. *Mississippi*: Seventh biennial report of the Forestry Commission, biennium ending 30th June, 1939; and the first biennial report of the State Board of Park Supervisors, biennium ending 30th June, 1939. *New Zealand* (1): Fourteenth annual report of the Department of Scientific and Industrial Research, 1939–40. *New Zealand* (2): Annual report of the Director of Forestry for the year ended 31st March, 1940. *Nigeria*: Annual report on the forest administration for the year 1939. *Ontario*: Report of the Minister of Lands and Forests for the fiscal year ending 31st March, 1939. *Sarawak*: Annual report on the Forest Department for the year 1939. *Sierra Leone*: Forestry report for the year 1939. *Transvaal*: Timber Research Laboratory. Consultant's Report 1939. *Trinidad and Tobago*: Administration report of the Conservator of Forests for the year 1939. *United States* (1): Annual report of the North-eastern Forest Experiment Station for 1939. *United States* (2): Nineteenth annual report of the Southern Forest Experiment Station for 1939.

The numbers in brackets indicate the pages of the reports to which the annotations refer.

GENERAL FORESTRY

Kenya. The total outturn of saw timber in the log was 1,167,223 cu. ft. (5, 20).

Malaya. Timber production totalled 15,186,763 cu. ft. of logs and 4,976,193 cu. ft. of sawn timber (9).

Manitoba. Wood cut on Provincial Crown Lands, including all products and species, totalled 24,012,000 cu. ft. (13).

New Zealand (2). State forests total 8,450,546 acres, which is 12.72 per cent. of the total land area. Five million acres of this has been permanently reserved (2, 8). A total of 112 million bd. ft. were cut from the State forests (22).

Ontario. Over 12 million trees were planted in the Province in 1938 (112).

Sierra Leone. While exotic species have been found to be unsuitable for rehabilitation work, fire protection and the use of indigenous species appear to give beneficial results (4).

Trinidad and Tobago. The total area of forest land is 582,029 acres and the State forests total 556,029 acres, of which about 10 per cent. is production reserves, 40 per cent. protection reserves, and 50 per cent. unreserved (11).

United States (1). Losses resulting from the hurricane of 1938 in the Spruce and northern hardwood region appeared to be heavier in softwood than in hardwood stands and in general in treated than in uncut stands, while on selectively cut plots in the northern hardwood type, loss appeared to increase with decrease of time since cutting (1–2).

SILVICULTURE

Arkansas. Tests of the effect of growth-promoting substances on the rooting of 16-in. Cottonwood cuttings, each treatment being 10 mg. per l. for 24 hours, indicated that the commercial preparations Auxilin and KAK were more effective than the chemicals indole-3-acetic acid, indole-3-butyric acid, indole-3-propionic acid, and naphthalene-acetic acid. Of these chemicals the last two seemed the best. Cottonwood seed stored at 40° F. in sealed flasks from which air had been exhausted showed 60 per cent. germination at the end of 8 months (87). On relatively dry sites Cottonwood seedlings and pruned seedlings showed 60–70 per cent. survival as compared with 30–40 per cent. for cuttings (88).

Australia (1). Monterey Pine (*P. radiata*) has been successfully raised from cuttings and investigations on technique and on the comparison of trees so produced with the parent are being continued. Other conifers from which cuttings have been struck include *Abies concolor*, *Sequoia sempervirens*, *Pseudotsuga taxifolia*, *Pinus muricata*, and *P. canariensis* (from epicormic shoots). Poor results have been obtained with *P. ponderosa* and *P. laricio* (5, 12-3). A great reduction in increment in the lower part of the stem and in the horizontal roots near the butt of the tree has been observed in specimens of Monterey Pine and Alpine Ash (*Eucalyptus gigantea*) that had been guyed with wire stays to prevent sway. Removal of the stays at the end of two years caused the trees to bend over in a large bow (5-6). The amount of starch in the photosynthetic tissue, endodermis and transfusion tissue in the leaves of Monterey Pine varies with time of year and position on the tree, stored starch increasing in quantity as winter approaches, and starch accumulation increasing from none in the lowest green leaves to a high content in leaves in full sunlight in the upper part of the tree. It appears that the lower limbs are mostly self-supporting and add little to the growth of the stem (6). An investigation of the effect of trenching on the survival of Monterey Pine seedlings planted and sown under a 19-year-old stand showed that while light is essential to vigorous growth of seedlings, soil moisture is the factor limiting their survival in Australia (7-8). It has been determined that plantations of Monterey Pine of high quality and spaced at 10 ft. $\times$ 9 ft. can be green-pruned to a height of 8 ft. at 6 years of age without reducing increment significantly (12). Investigations of freshly felled trees indicate that fast-growing trees have a significantly higher moisture content than those of slow growth (13).

Bihar. Regeneration fellings of Sal (*Shorea robusta*) now consist in the removal of all the overwood, except 3-5 standards per acre, in one operation (9). Suppressed Sal poles do not respond at once to overhead light and should be cut back to give them a fresh start (9, 20). Sowing and planting experiments with *Gmelina arborea* and *Dalbergia sissoo* appear to be successful (11, 20). Experiments indicate that Simul (*Bombax malabaricum*) can be raised successfully by cold-weather planting of root and shoot cuttings and that Shisham (*Dalbergia sissoo*) can be raised from branch cuttings (20).

Canada. Hormones incorporated in minute quantities with an inert dust will stimulate the rooting of plant cuttings. A commercial hormone powder has been placed on the market. The crossing of Poplars to obtain fast-growing and disease-resistant varieties has been found to be practicable (9).

India and Burma. Teak seed of north and south Burma origins proved to be more frost-hardy than that from Bombay (moist and dry sites), Travancore and Jhansi. Marked differences were noted in habit and rate of growth of *Acacia catechu* of ravine and riverain origins (7). The removal of root-competing undergrowth caused a significant increase in the diameter increment of Sal though not of *Cedrela toona*, *Phoebe lanceolata* or *Holoptelea integrifolia* (8). The lower branches of *Pinus longifolia* are quickly suppressed and die but persist on the tree after death. The pruning wounds of Sal produce tufts of thin epicormic branches (9-10). Stumps of *Dalbergia sissoo* and *Morus alba* will survive storage in damp gunny bags for periods up to 25 days. Nursery-grown plants of *Bauhinia variegata* and *Cedrela toona* have been found superior to natural forest plants for transplanting (13). A comparison of stump planting, direct sowing and transplanting showed that the first method gave best results for *Acacia catechu*, *Bombax malabaricum*, *Cedrela toona*, *Celtis tetrandia*, *Dalbergia sissoo*, *Pterospermum acerifolium* and *Broussonetia papyrifera*, while first-year results indicate that entire transplanting is more favourable for *Hovenia dulcis*, *Markhamia platycalyx* and *Morus alba* (15). Removal of pulp from seed of *Azadirachta indica* and *Terminalia chebula* resulted in marked improvement in germination, for the latter particularly when the depulped seed was fermented in straw (19).

Kenya. From recent observations it has been possible to estimate the rotation for Bamboo and to determine the precautions necessary at time of cutting to ensure proper regeneration (details in *Forest Department Research Bulletin*, No. 16). Very wide early spacing of Black Wattle (*Acacia mollissima*) in Kenya appears to result in serious damage by frog-hopper and in heavy branching, which spoils tree form and leads to wind breakage (14). Ten-year-old *Cupressus macrocarpa* growing in plantation with *Dombeya mastersii* showed a current annual increment of about 500 cu. ft. per acre under very good growing conditions (annual rain 60 in., good soil, temperature 50°-70° F., altitude 7,000 ft.) (14-5).

Malaya. Exotics successfully raised from seed include *Agathis robusta* from Australia and

Eucalyptus platyphylla, *E. alba* and *E. robusta* from Java (16). A successful method for increasing speed of germination of Merbau (*Intsia palembanica*) seed consists in breaking the seed coat with a stroke of a rough file and soaking seed in cold water before sowing (17).

New Zealand (2). Shade-bearing exotics, principally the species *Thuja plicata*, *Cryptomeria japonica*, and *Chamaecyparis lawsoniana*, that have been introduced into the indigenous forest within a year after logging can maintain their position with competing second growth and furnish an early timber yield while the natural regeneration is developing to maturity (11). Natural regeneration of the exotic species *Pinus laricio*, *P. radiata*, *Pseudotsuga taxifolia*, *Larix decidua* and *Pinus muricata* is very good under a variety of ground-cover conditions and the seedlings appear to grow more vigorously than do planted trees. The summer seems to be the safest time for the green pruning of *P. radiata* (13).

Nigeria. Species of the genera *Paradaniellia*, *Isoberlinia*, *Afrormosia*, *Burkea*, *Parinari* and *Prosopis* will coppice from the small remnant roots after the main roots of the tree have been removed (10). Cost of *taungya* planting has been reduced by the use of 'bush' nurseries established near the planting site, the seedlings being grown cheaply without watering (12) [cf. *For. Abs.* 2 (203)].

Sarawak. Plantation experiments with Jelutong (*Dyera lowii*) show relatively poor results from cotyledon seedlings and 6- to 8-in. plants while excellent results were obtained with large plants (10).

Trinidad and Tobago. Preliminary tests showed that the exotics *Aspidosperma quebracho* and *Gleditsia amorphoides* are unsuited to local conditions. The mulching of natural Cedar (*Cedrela mexicana*) seedlings in semi-deciduous forest was effective in reducing mortality during the dry season, only 12 per cent. of the mulched seedlings dying as compared with 60 per cent. of the control (6).

United States (1). Experiments in northern hardwood stands indicate that weeding is justified where there are sufficient potential crop trees and should be undertaken before the stand is 10 years old. Sugar Maple and White Ash show good growth following selection cutting while Yellow Birch bordering the small openings may die off (3). The dughole method of planting has been found superior to other methods for general use (5). Optimum storage conditions for the pollen of Red and White Pine appear to be 25 per cent. relative humidity and 4° C. (8).

United States (2). Study has shown that nitrogen deficiency is injurious to all southern Pine species, potassium deficiency is injurious to Slash, Loblolly and Shortleaf Pine, calcium deficiency appears to reduce root development of Loblolly Pine, magnesium deficiency reduces the vigour of Longleaf Pine seedlings, and lack of sulphur is injurious to Shortleaf Pine only (8-9). Root competition between seedlings and grasses for both water and mineral nutrients is one of the factors controlling the length of the period of slow growth of Longleaf Pine seedlings following germination (9). In a study to determine the best treatment for maintaining soil fertility in the seedbeds of a permanent nursery, the rotation of two years of Pines followed by one of fertilized cowpeas was found to produce superior Pines that were relatively free from chlorosis and other maladjustments (9-10).

EXTRACTION, UTILIZATION AND MARKETING

Arkansas. The relative efficiency of labour as measured by lumber production per man-day, is much lower for portable than for stationary mills (85).

Australia (1). Gum ducts occur to some extent in all species of Eucalypts, render many species useless and are the main cause of timber rejections. Their anatomy has been studied but the causal stimulus is still unknown (4).

Australia (2). The boric-acid treatment to prevent *Lyctus* attack on veneers has been successfully tested commercially for nearly two years and it is now planned to extend this treatment to 1 in. boards (2). A quick method for deciding the cooking condition for sulphate pulps has been worked out using the relationship between the water-soluble extract of chips and the lignin content of the pulps (3).

Ceylon. The wood of Lawulu (*Chrysophyllum roxburghii*) and Aridda (*Camposperma zeylanicum*) has been reported as satisfactory for solid tea chests, and Nava (*Sterculia balanphas*) for match boxes. Limited tests of natural and plantation-grown *Melia composita* indicate that the latter is slightly heavier and has superior bending qualities. *Anogeissus latifolia* is reported as suitable for axe handles (G10).

NOTES FROM ANNUAL REPORTS

India and Burma. *Pinus insignis* from the south and *P. longifolia* from the Himalayas have been shown to have similar strength properties and utilization values (47). In kiln-drying tests on light woods for packing cases, shooks of Tula (*Tetrameles nudiflora*) $\frac{1}{2}$ – $\frac{3}{8}$ in. thick were dried from an average moisture content of 120 per cent. to about 10 per cent. in 30–36 hours. Planks of Simul (*Bombax malabaricum*) $\frac{1}{2}$ in. thick, took 48 hours to dry (52).

Nigeria. *Triplochiton scleroxylon* is suitable for box shooks if precautions are taken against stain (19). The value of Wolman Salts as a wood preservative was confirmed in graveyard tests on *T. scleroxylon* (20).

Sarawak. Nineteen out of 28 species remain after four years of a graveyard durability test and of the 19, Belian (*Eusideroxylon zwageri*) remains entirely sound and Merbau (*Intsia bakeri*), Chengal (*Hopea pachycarpa*), Resak (*Cotylelobium* and *Vatica* spp.), and Sumah (*Archytaea vahlii*) show high resistance to attack (12).

Transvaal. It is found that absorption of preservatives by timbers of *Eucalyptus saligna* and Wattle increases with increased pressure up to at least 110 lb. per sq. in. (3). The sapwood of Pitch Pine (*Pinus rigida*) is very susceptible to fungal and insect attack and may be destroyed within two years under conditions conducive to such attack (4). Untreated chock mats of *Eucalyptus saligna* were completely decayed and their strength reduced to one-tenth that of treated material at the end of 18 months under conditions of 83°–82.5° F. and relative humidity of 97 per cent. Wattle mats were not so badly affected (5).

Trinidad and Tobago. The heartwood of Trinidad-grown Teak was found to be distasteful to drywood termites (7).

United States (1). Slow-combustion wood heaters that have been tested give a relatively high performance for wood stoves as to heat, economy and convenience (8–9). A study of the problems relating to efficient utilization and marketing of farm woodland raw materials and of the economic aspects of co-operative forestry in the eastern hardwood region has been in progress since 1935 (10).

United States (2). On the basis that time of year of chipping and that frequency of chipping over a short period in the summer does not affect the total production of naval stores, a number of chipping-frequency schedules have been developed to meet various management objectives (11). Reduction of the moisture content of green lumber to 45–52 per cent. by end-racking will prevent attack by ambrosia beetles (22).

PROTECTION

Alberta. Brief description is given of the radio communication equipment that has been installed at a number of fire look-out towers (75–80).

Ceylon. New insect pests that were recorded during the year include: *Glyphodes marginata* (Hamps) defoliating seedlings of *Alstonia scholaris*, *Papilio demoleus-demoleus* (Liam.) defoliating *Chloroxylon swietenia*, *Eurema hecabe simulata* (Moore) on seedlings of *Cassia siamea*, *Pycnarmon meritalis* (Walk.) on *Chickrassia velutina*, *Hyblaea pueria* (Cram.) defoliating Teak, and *Batocera rubus* attacking young seedlings of *Artocarpus integra* (G8).

India and Burma. A study has been made of the life history of the Mahogany collar borer (*Pagiophloeus longiclavis*) (37). Overhead shade, particularly that afforded by deep undergrowth, prevents increase in incidence of attack by this species (38).

Malaya. Logs of Pulai (*Alstonia scholaris*) stored either in water without bark or in storage shed with bark intact, for a period of three months, lost a considerable amount of starch and were not susceptible to attack by powder-post beetles (19–20).

Manitoba. Crawler tractors and heavy breaking ploughs were found to be effective and more economical than shovels in trenching for fire protection (22). Considerable use is made of air patrols in the detection of forest fires (28–30).

New Zealand (1). The Australian Gum emperor-moth (*Antheraea eucalypti*) has been identified on Eucalypts in New Zealand (17). The Australian termite *Coptotermes acinaciformis* is well established in New Zealand and attacks all commonly used timbers and has also become established in native trees such as Puriri (*Vitex lucens*) and Pohutukawa (*Metrosideros tomentosa*) and in exotic Oaks and Poplars (27). The Cerambycid beetle *Ambeodontus tristis* and *Anobium domesticum* are also found to be widespread in New Zealand (60). Tests of a number of solvents for use in carrying water-soluble organic therapeutants into wood resulted in irregular penetration of each

material used, none going more than $\frac{1}{10}$ in. into straight-grained surfaces, although penetration was better when the grain ran in slightly from the surface. Tests were made with seven petroleum oils and methyl-ethyl-ketone, and the woods used were Rimu (*Dacrydium cupressinum*) and Matai (*Podocarpus spicatus*) (60).

New Zealand (2). The wood of *Pinus strobus* has been found to be satisfactory for fire-hazard indicator sticks as it conforms closely in moisture-content changes to the vegetative type of highest fire risk (15). *Armillaria mellea* is prevalent in plantations of exotics as well as the indigenous forest (17-8).

Nigeria. Insect pests recorded include: *Loranthus* sp. endemic on indigenous species and attacking *Dalbergia* plantations, and a wood borer attacking *Khaya ivorensis* and found in the northern limit of the Mahogany forest (9).

United States (1). Investigations show that *Nectria* canker infection usually takes place in living or dying branches less than $\frac{1}{2}$ in. in diameter or commonly at the axil, and that dormant-season injuries are more susceptible to infection than those occurring in the spring or early summer (17). The fungus *Rehmiellopsis bohémica* has been found attacking *Abies balsamea* in Maine (18) [cf. *For. Abs.* 2 (192)].

United States (2). Factors that affect the length of time between fire origin and time of first discovery are rate of spread, visibility distance, and distance from fire to the lookout (10). Late sowing and early and thorough spraying of seedlings appears the best control for the canker-forming rusts of Pine, *Cronartium fusiforme* and *C. cerebrum* (23) [cf. *For. Abs.* 2 (246)].

ECONOMICS, MANAGEMENT AND POLICY

Alabama. Acts that came into effect in 1939 include: (a) one for the prevention and control of forest fires, (b) one that provides for the assessment of a tax of 4 cents per acre on all forested land on the request of the majority of freeholders or landholders within a county, the money to be spent for forest fire protection in that county, and (c) one that provides for the management and supervision of school lands and swamp and overflowed lands by the Director of Conservation (15-6).

Malaya. A Mining Enactment has come into force in Kelantan, which 'gives the State Forest Officer certain powers of control over the exploitation of timber on mining land' (55).

Mississippi. A model contract was drawn up as a basis for negotiations between mill operators and timber owners with the object of interesting them in better wood practices. Under this contract production of forest products would be on a co-operative basis and cutting would be selective and follow the principle of sustained yield (10). Nearly 16 million acres or 53 per cent. of the land area is classified as forest land, and of this 40 per cent. is Pine type, 19 per cent. Pine/hardwood type, 25 per cent. bottomland hardwoods and Cypress, and 16 per cent. upland hardwoods (18-9).

Nigeria. A recent development in forest reservation is the creation of Communal Forestry Areas in the Northern Provinces. Villages or groups of villages will set aside small areas for the free supply of forest produce to meet their own requirements. The local people will manage these forests under the advice of the Forest Officer (2).

Ontario. An amendment to existing legislation gives to townships the power to obtain land, reforest it, and grant exemption from taxes (8). Provisions for the management of Red and White Pine stands in the Temagami Provincial Forest include protection of lake shore lines, burning of logging slash, reserving seed trees, and the planting of Red and White Pine and White Spruce on areas lacking natural reproduction (21-2).

NOTES FROM THE DAILY AND THE NON-TECHNICAL PRESS

[Continued from *For. Abs.* 2, 1940 (93-5).]

References: 1. *Asyrmatos*, Athens. 2. *Bulletin on the Soviet Union*, New York. 3. *Dominion*, Wellington. 4. *La Esfera*, Caracas. 5. *Evening Post*, Wellington. 6. *Hrvatski Dnevnik*, Zagreb. 7. *Izvestiya*, Moscow. 8. *Madrid*, Madrid. 9. *La Mañana*, Montevideo. 10. *El Mercurio*, Santiago and Valparaiso. 11. *El Mundo*, Buenos Aires. 12. *Ostsee Zeitung*, Tallinn. 13. *La Prensa*, Buenos Aires. 14. *La Presse*, Montreal. 15. *Proia*, Athens. 16. *Sotsialisticheskoe Zemledelie*, Moscow. 17. *Südost Economist*, Budapest. 18. *Taranaki Daily News*, New Plymouth. 19. *Vancouver Sun*, Vancouver. The numbers in brackets indicate the reference number and the date of publication of the newspapers to which the annotations refer.

Argentine. Some 5 million ha. in the south and west of the Province of Buenos Aires have become practically sterile as a result of erosion which followed on the ploughing-up of relatively dry pasture land unsuitable for permanent cropping. At present erosion-control studies are being conducted by the Government (11; 9.5.40 and 13; 9.5.40).

Balkan States. A characteristic feature of the Balkan forests is the preponderance of broad-leaved species. However, since 70-80 per cent. of timber exports and over one-half of the internal timber consumption consists of softwoods, both Rumania and Yugo-Slavia, which are the chief exporters, will have to neglect for the time being the conservation of their softwood forests. The annual export of these two countries totals about 2.5 to 3 million cu. m. of timber, while Hungary and Greece import about one-half that amount. In 1938 Germany and Italy bought 887,000 of the 2½ million cu. m. of timber exported from Rumania and Yugo-Slavia in that year (17; 7.6.40).

Canada. It is estimated that as much as 450 to 500 million cu ft. of timber will be felled in the Province of Quebec during the 1940-41 season, owing largely to the need of supplying to an increased extent the timber and pulp requirements of Great Britain. This will involve the employment of some 75,000 men on felling and extraction work, i.e. about 25,000 more than last year (14; 6.9.40).

A representative of the Canadian Forestry Association has just completed a five months' tour with a travelling motion-picture unit. Most of the Province of British Columbia was covered in this year's tour of almost 12,000 miles during which 200 shows were given illustrating the need for forest fire control (19; 23.10.40).

Chile. A national afforestation project involving a total expenditure of 60 million Pesos over a period of 20 years is being considered by the Chamber of Deputies. (Exchange approximately 95 Pesos = £1). One of the main objects in view is to arrest the gradual advance of the Atacama desert into the Provinces of Atacama and Coquimbo (10; 15.6.40).

Finland. A charcoal factory is being built by the State Forest Service at Lahti, Central Finland, for the manufacture of charcoal fuel for producer-gas lorries. Production is to begin this summer. The raw material will consist mainly of wood waste from sawmills (12; 17.6.40).

Greece. Under the Forest Law of 1937, the exploitation of major produce from State forests was to be undertaken by the Forest Service instead of by private contractors, as has been the usual practice in the past. The application of this provision is being rapidly extended to an increasing proportion of the State forest area. The Service takes special care to maintain regular supplies of material suitable for the production of railway sleepers, in which Greece has now become entirely self-supporting (1; 25.7.40).

A decree has just been passed making provision for the employment of an additional contingent of 200 forest guards to be recruited among villagers. Their main duties will consist in the protection of forests from unauthorized cutting and resin tapping (15; 31.8.40).

New Zealand. The school teachers of Hastings, Hawke's Bay, recently forwarded a resolution to the Minister of Internal Affairs urging bush and bird preservation. The interest shown in such matters by some of the schools of the Dominion is considered one of the most welcome signs for the development of a forest and wild-life sense among the public (3; 9.4.40).

Comments on the 1940 annual report of the State Forest Service welcomed the criticism contained in that report of the insufficient recognition of the industrial need for age classes, which has marked both public and private afforestation in the past and which has been closely associated with the desire for rapid unemployment relief. Commenting on the erosion-control investigations that are being conducted by the Service, it is suggested that if such investigations hold out any hope of a remedy, expenditure upon them is a very sound investment even in war time (5; 3.8.40 and 18; 7.8.40).

This year's Arbor Day was celebrated on an especially large scale, the functions being mainly part of the Centennial Celebrations. In many cases they were the climax of a long period of careful preparation by the various educational authorities. Apart from State and regional celebrations nearly all local schools had planting ceremonies of their own (5; 7.8.40).

Spain. A law has been passed approving 'extraordinary' expenditure for the afforestation of 13,000 ha. and for expediting natural regeneration on 10,000 ha. in 1940 (8; 23.11.39).

Uruguay. The planted forest area of Uruguay totals 72,145 ha., of which 46,530 ha. are Eucalypts and 6,719 ha. Poplars. Future planting should aim at the production of more valuable timber which at present has to be imported from abroad. The few natural forests of the country have been practically depleted of valuable timber species (9; 22.6.40).

U.S.S.R. Collective farms in many parts of the Soviet Union are severely criticized for neglecting the proper maintenance of existing shelterbelts and for not creating new ones on anything like an adequate scale. Two instances are quoted where neglected windbreaks have become centres of infestation from which agricultural insect pests including locusts have spread into the surrounding fields (16; 2.6.40).

The former Polish territories Western Ukraine and Western White Russia, now amalgamated into the Ukrainian and the White Russian Republic, respectively, possess very considerable timber resources. The reserves of Western Ukraine amount to some 120 to 140 million cu. m. and should prove very important to the entire Republic which lacks timber elsewhere. Those of Western White Russia amount to about 200 million cu.m. In both regions the sawmill industry, though relatively better developed than other manufacturing industries, is made up of small mills for the most part. Thus in Western Ukraine 117 out of 188 mills employ fewer than 100 workers each. Future expansion of the industry will depend on overcoming the smallness of the mills and the inadequate transport facilities of the lumbering regions. In addition to sawmills there are in Western Ukraine four paper factories and one new plant with equipment to produce cellulose products, and there is one match factory in Pinsk in Western White Russia (2; 7.6.40).

From an article by A. Gael' on protection against shifting sands:—The problem of wind erosion is becoming increasingly acute in the semi-deserts and steppes of the Asiatic Republics. In the last 10–12 years, only some 26,000 ha. of the most dangerous shifting sands of Turkmenia and Uzbekistan have been fixed. This figure is quite inadequate and lags far behind the growth of new inland dunes. Over-grazing is the main cause of such erosion, and is particularly severe where wells are ill-distributed. For instance, in the Kazandzhik State Farm in Turkmenia constant sheep grazing around the same set of wells has resulted in 50–60 per cent. of the original sandy pasture of 312,000 ha. becoming sterile and eroded. Other causes of wind erosion are the growing on sandy land of barley, melons, &c. without due regard to soil conservation and the extravagant exploitation of trees and shrubs for firewood. The sands of the semi-deserts carry some 14 million ha. of *Haloxylon ammodendron* Bge. ('Saksaul') woods affording a great measure of protection, but these woods are being destroyed where they are needed most to protect townships and lines of communication. The writer suggests that a special administrative body be set up to co-ordinate all activities concerning the husbandry of sandy soils, including regulation of pasture, creation of shelterbelts, reservation of strips of protective woodland, and afforestation. The planting of *H. ammodendron* woods is considered particularly promising in the southern semi-deserts where since last year the building of irrigation canals has been proceeding on a large scale (16; 18.7.40).

The Alma-Ata botanical garden, Kazakstan, has been conducting experiments since 1934 to acclimatize the Amur Cork Tree, *Phellodendron amurense*. The garden has now a number of fruit-bearing trees and about a thousand seedlings, so that the experimental stage of the work may be considered as concluded. The tree is native to the temperate regions of the Far East. Its cork bark may be peeled off several times and the timber is used in furniture making (7; 8.9.40).

Venezuela. A plea is made for land utilization surveys; at present irrational exploitation of valuable forests is rampant in some parts of the country while useless woodlands are preserved elsewhere on land that is both suitable and required for agriculture (4; 17.7.40).

Yugo-Slavia. The forestry authorities are criticized for inadequate regulation of extraction by foreign companies—apart from the fact that the cut has exceeded the increment, such extraction has resulted in large areas of Oak and other woodland being transformed into scrub; and for negligence in reforestation, particularly as to care after planting and protection of plantations from damage by man. It is estimated that the latter type of damage accounts for 17.5 out of the 22 million Dinars that are lost annually through unsuccessful reforestation. (Exchange approximately 200 Dinars = £1) (6; 2.8.40).

LIST OF ADDITIONAL ABBREVIATIONS

(Based on the *World List of Scientific Periodicals*)

- | | |
|--|---|
| <i>Amer. Nat.</i> | American Naturalist. Boston. |
| <i>An. Acad. B. Aires</i> | Anales de la Academia de Ciencias Exactas, Físicas y Naturales. Buenos Aires. |
| <i>Bull. Ark. agr. Exp. Sta.</i> | Bulletin. University of Arkansas Agricultural Exp. Sta. Fayetteville. |
| <i>Bull. Davey Tree Expert Co.</i> | Bulletin. Research Department, Davey Tree Expert Co., Kent, Ohio. |
| <i>Bull. For. Br. Ont.</i> | Bulletin. Forestry Branch, Department of Lands and Forests, Ontario. Toronto. |
| <i>Bull. Ind. agric. Exp. Sta.</i> | Bulletin. Indiana (Purdue University) Agricultural Exp. Sta. Lafayette. |
| <i>Bull. Mass. For. Parks Ass.</i> | Bulletin. Massachusetts Forest and Parks Association. Boston. |
| <i>Bull. N.H. agric. Exp. Sta.</i> | Bulletin. New Hampshire Agricultural Exp. Sta. Durham. |
| <i>Bull. nat. Mus. Can.</i> | Bulletin. National Museum of Canada. Ottawa. |
| <i>Bull. Soc. bot. Bulg.</i> | Bulletin de la Société Botanique de Bulgarie (Izvestiya na Bulgarskoto Botanichesko Druzhestvo). Sofia. |
| <i>Bull. Soc. bot. Genève</i> | Bulletin de la Société Botanique de Genève. Geneva. |
| <i>Bull. tech. Mus., Sydney</i> | Bulletin. Technological Museum, Sydney. |
| <i>Bull. Tex. agric. Exp. Sta.</i> | Bulletin. Texas Agricultural Exp. Sta. College Station. |
| <i>Circ. Dep. Agric. Can.</i> | Circular. Department of Agriculture, Canada. Ottawa. |
| <i>Circ. For. Br. Ont.</i> | Circular. Forestry Branch, Department of Lands and Forests, Ontario. Toronto. |
| <i>Circ. Ky. Coll. Agric. Ext. Div.</i> | Circular. Kentucky College of Agriculture Extension Division. Lexington. |
| <i>Circ. Ont. Dep. Agric.</i> | Circular. Ontario Department of Agriculture. Toronto. |
| <i>Conserv. Bull. Mo. Conserv. Comm.</i> | Conservation Bulletin. Missouri Conservation Commission. Jefferson City. |
| <i>Fmrs' Bull. Dep. Agric. Can.</i> | Farmers' Bulletin. Department of Agriculture, Canada. Ottawa. |
| <i>For. Leaves</i> | Forest Leaves. Philadelphia. |
| <i>For. Publ. Civ. Conserv. Corps</i> | Forestry Publication. Civilian Conservation Corps. Washington, D.C. |
| <i>J. E.Afr. Ug. nat. Hist. Soc.</i> | Journal of the East Africa and Uganda Natural History Society. London. |
| <i>J. roy. Soc. N.S.W.</i> | Journal of the Royal Society of New South Wales. Sydney. |
| <i>J. S. Afr. Bot.</i> | Journal of South African Botany. Kirstenbosch. |
| <i>J. Soc. chem. Ind. Japan</i> | Journal of the Society of Chemical Industry of Japan. Tokyo. |
| <i>J. Wash. Acad. Sci.</i> | Journal of the Washington Academy of Science. Washington. |
| <i>Medd. Vestland. forstl. Forsøkssta.</i> | Meddelelser fra Vestlandets forstlige Forsøksstation. Bergen. |
| <i>Niger. For.</i> | Nigerian Forester. Ibadan. |
| <i>Occ. Pap. Ntheast. For. Exp. Sta.</i> | Occasional Paper. Northeastern Forest Exp. Sta. New Haven, Conn. |
| <i>Pap. roy. Soc. Tasm.</i> | Papers and Proceedings of the Royal Society of Tasmania. Hobart. |
| <i>Philipp. Agric.</i> | Philippine Agriculturist. Los Baños. |
| <i>Priroda Akad. Nauk S.S.S.R.</i> | Priroda. Akademiya Nauk S.S.S.R. Leningrad. |
| <i>Proc. nat. Shade Tree Conf.</i> | Proceedings of the National Shade Tree Conference. |
| <i>Rep. nat. Res. Coun. Can.</i> | Report. National Research Council of Canada. Ottawa. |
| <i>Res. Note B.C. For. Serv.</i> | Research Note. British Columbia Forest Service. Victoria. |
| <i>Sth. For. Notes</i> | Southern Forestry Notes. Southern Forest Exp. Sta., New Orleans. |
| <i>Trans. roy. Soc. N.Z.</i> | Transactions of the Royal Society of New Zealand. Wellington. |
| <i>Tree Pres. Bull. U.S. Nat. Park Serv.</i> | Tree Preservation Bulletin. U.S. National Park Service, Washington, D.C. |

LIST OF ADDITIONAL ABBREVIATIONS

Libraries, other than that of the Imperial Forestry Institute, from which literature was obtained for purposes of recording and abstracting in the present number of *Forestry Abstracts*.

Designation:

A.P.B.
C.G.B.
L.S.
O.B.D.
O.R.E.
O.R.S.
P.R.

Imperial Bureau of Pastures and Forage Crops, Aberystwyth.
Imperial Bureau of Plant Breeding and Genetics, Cambridge.
The Science Library, London.
The Department of Botany, Oxford.
The School of Rural Economy, Oxford.
Radcliffe Science Library, Oxford.
The Forest Products Research Laboratory, Princes Risborough.

Library of:

Abstract and reference journals referred to in this number:

(1) *Publications of the Imperial Agricultural Bureaux:*

R.A.E.	Review of Applied Entomology. London.
R.A.M.	Review of Applied Mycology. London.

(2) *Other publications:*

B.C.P.A.	British Chemical and Physiological Abstracts. London.
Building Sci. Abs.	Building Science Abstracts. London.
Chem. Abs.	Chemical Abstracts. Easton, Pa.
For. Curr. Lit.	Forestry Current Literature. Washington, D.C.
Fuel Res. Summ.	Fuel Research Summary. East Greenwich, London.
Pl. Sci. Lit.	Plant Science Literature. Washington, D.C.
Soil Conserv. Lit.	Soil Conservation Literature. Washington, D.C.